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THE NORTHWESTERN CONVENTION.

Among the chief matters of discussion at the Northwestern Electrical Association convention held at Milwaukee last week, were the various effects of the new public service bill which has been in effect in Wisconsin for some months, and other matters pertaining to State regulation. Wisconsin being the first of the Middle Western States to adopt regulation of public service companies by commission, much interest is manifested in the developments there by the central-station men of surrounding States as well as by those of Wisconsin, who are directly affected. The general sentiment seems to be that the effect in the long run will be good both for companies and public, in spite of any little friction there may be in getting the new machinery started. The Northwestern Electrical Association at this convention faced a situation which has been developing for the past several years. When the association was organized there was no other organization of the kind in the country except the National Electric Light Association. The Northwestern Association was intended to take in all classes of electric light, power and railway men in the States north and west of Chicago. After an era of some prosperity, the interest in the association, for various causes which it is not necessary to discuss here, began to lag. State associations of electric light companies began to spring up and thrive in what had before been considered Northwestern territory. Illinois, Iowa and Michigan formed state associations, and two ill-fated attempts were made in Indiana. The Northwestern Association for some time has, therefore, been practically a Wisconsin Association with a few attendants from Minnesota, Illinois and northern Michigan. State associations were easier for members to attend, and the state associations in some cases have played an important part in keeping members posted as to harmful bills brought up before state legislatures, so that a representative of the association could appear before the legislative committees having these bills under consideration, and in some cases various members could point out to the representatives from their respective districts the fallacy of the bills proposed. In fact, it has in some states seemed to be absolutely necessary to take some measures to prevent "fool legislation" going through in the absence of any one to point out its character. The Northwestern Electrical Association a number of years ago, through committees in various states, made an attempt to keep track of legislation in various states where it had members, but this did not yield practical results of any value, and was dropped.

In the meantime, in the past year, in the state of Wisconsin, there was organized the Wisconsin Electric and Interurban Railway Association, composed of both lighting and railway companies in the state of Wisconsin. The province of this association has been confined strictly to questions pertaining to state control, accounting and legislation. Its representatives have appeared before legislative committees on proposed legislation,

and it is about to take up an important work in co-operation with the Wisconsin commission in getting up an acceptable standard form of accounts which shall be both acceptable to the commission and practicable for the companies. Many members of the Northwestern Electrical Association also have company membership in the Wisconsin Electrical and Interurban Railway Association. Both associations held meetings in Milwaukee last week, and it was but natural that the question of maintaining two associations in one state should come up for consideration, and that action should be taken looking toward some kind of a consolidation of the two associations. The Northwestern Association has some active and valuable members from Minnesota and other states, and the association put itself on record as opposing any reorganization scheme which will legislate these members out of the association. It seems likely that some scheme of consolidation can be worked out by the committees which have been appointed which will accomplish the desired end of giving members outside of Wisconsin the privileges of participation in conventions, while at the same time providing for special assessments of Wisconsin members to take care of whatever extra expenses seem necessary to properly safeguard Wisconsin interests and to co-operate with the state commission. The Wisconsin commission is establishing precedents rapidly these days in the first year of its existence, and it is important that both sides of each case coming before the commission be fully presented in order that correct precedents be established. It is evidently the desire of the commission that this be done. Each case decided involves much more than its immediate effect on the company involved in the case. It establishes precedents which all the other companies in the state must follow; hence, an association representing all the companies should be very properly represented at all hearings, and it is evidently the desire of the commission that this be so.

The Patent Office Gazette.

We cannot drop the recent discussion on the cutting down of published claims in the *Patent Office Gazette* without comment on the wide difference in the views presented. Patent attorneys have in our columns presented every shade of opinion on the subject, and some of the suggestions made were most pertinent. We think all hands will agree that upon the whole, the *Gazette* ought to be so conducted as to be of the greatest feasible usefulness to the class whose money supports it, namely, the inventors. And the chief question is, in how far is the publication of all the claims essential to this usefulness? As some of our correspondents have pointed out, none of us can properly evaluate the full scope of a patent without the full document before him. Claims are understood to be read in the light of the specification and drawings, and not merely as isolated examples of frequently very involved and unintelligible English. The inventor, however, wishes to post himself thoroughly as to the general condition of the art before going far with his work, and this he ought to be able to do without going to the expense of buying or hunting up the full class to which his invention belongs. Some inventors go so far as to send for and study the class, and even to look into the full state of the art and fortify themselves with material for defending their invention before filing an application, but as a rule they rely on the *Gazette* to put them in touch with the facts.

Hitherto the *Gazette*, while obviously imperfect, has given much useful information. It has given a drawing thoroughly typical of the construction employed, and has given the claims in full, so that their general scope is at once evident. The specification, when read, is generally found to limit the claims rather than to broaden their scope, so that in looking over the claims the inventor is likely to know the worst. The attorney also gets a full view of the face value of the claims on which litigation is likely to be based. It is the rare exception when infringement of all the claims or of (in patents with many claims) any considerable part of them is claimed. Often only two or three claims out of a dozen are involved, especially when the claims are drawn upon the permutative system affected by some attorneys. In combinational claims, built up in this fashion, it often happens that the first half dozen claims may be by themselves entirely uninstructive as to the full scope of the combination. It would certainly be extremely easy, far too easy, to make the later claims in number the really important ones; and if the present rule is kept in force it will be very surprising if there is not ample evidence of this facility. We hardly share the fear of one of our correspondents that certain large interests may by ordering patents in quantity, endeavor to keep their important claims secret through keeping the patents out of print, since this could not be done save by practical connivance of the Patent Office, which is highly improbable; while in isolated cases an edition of specifications has thus been exhausted by devious methods in the past; if it were to become a practice, rules would very quickly be made to check the abuse.

The suggestion of carefully prepared abstracts of patents for the *Gazette* has much to recommend it, could it be successfully carried out. Any one who has ever tried to abstract patents, however, or who has frequently read abstracts, must realize the practical difficulties of doing it briefly and well. It is not enough to make clear the general nature of the invention, for many an injunction has been obtained on claims which, while legitimately in the patent, are altogether subsidiary to its conspicuous main features. Indeed, in patent litigation some of the most dangerous claims are of this casual sort, their subject matter being incidentally rather than fundamentally described in the specification. Were our patents of the German description, in which the inventor is tied up very tightly, one could abstract them more easily, but the liberality of our office toward the inventor lets through at times some pretty broad claims in an apparently narrow patent. It seems, therefore, all things considered, that the old practice is an important aid to the inventor who pays the bills, and should be continued, while, as we have before intimated, a better and more complete classification of patents kept sharply up to date is needed badly.

Magnetic Leakage in Induction Motors.

As pointed out in our issue for Nov. 23, no calculation connected with the predetermination of the performance of an induction motor is of greater importance than that relating to the leakage coefficient. Of almost equal importance from the point of view of the designer, however, is a knowledge of the effect upon the leakage of the various changes that may be made in the arrangement of the active material of the machine. Although the ability to predetermine the magnetic leakage in a motor involves a knowledge of the factors of design which

affect the leakage coefficient, yet the ability to select such proportion that the leakage coefficient is a minimum consistent with obtaining the required service performance from the completed machine is the true criterion of the designer's skill. In fact, it may almost be said that if the designer has so proportioned the parts of the machine that with the minimum of active material the desired efficiency is obtained and the allowable temperature rise is not exceeded, and the coils and core are so arranged as to obtain the minimum possible leakage coefficient without sacrifice of mechanical requirements, his task has been completed. That is to say, the real work of the designer is to obtain the minimum leakage coefficient when high-power factor is required, rather than merely to calculate the leakage obtained with an arrangement of coils and core which by chance may give a satisfactorily high efficiency and low temperature rise.

Our present issue contains an article by Mr. R. E. Hellmund supplementing an article which appeared in our issue for Nov. 23, 1907. In the latter article there was given a simple and convenient formula for determining the leakage coefficient of an induction motor from the known machine dimension. The article in this issue contains a discussion of the factors which influence the leakage coefficient without causing an appreciable change in the main flux of the motor. The chief value of the article resides in the practical information concerning the relative leakage around the end-connection of various styles of windings. It may be shown that the value of the main flux depends solely upon the number of conductors per phase-winding, and the distribution of the conductors in the slot, while the interlinkage of leakage flux and turns varies largely with the arrangement selected for interconnecting the ends of the conductors. Mr. Hellmund gives a well arranged classification of the several styles of winding commonly employed for induction motors with reference to the magnetic leakage, the cost of copper and the convenience in manufacture.

HUNTING OF ALTERNATORS DRIVEN IN PARALLEL.

The progress from former independent to present synchronous operation of alternators has been due to a number of causes. Firstly, alternators were originally single-phasers. Now they are nearly always polyphase machines, which are easier to synchronize and easier to maintain in synchronism automatically. Secondly, the frequency of alternation used to be over 120 cycles per second in this country. Now, it is either 60 cycles per second, or 25 cycles per second, and the lower frequency machines are easier to couple and to run coupled. Thirdly, the experience, experimental research and knowledge gained during the last 20 years in the behavior of coupled alternators has greatly improved their construction for the purpose of parallel running. Although dangerous hunting between paralleled alternators has ceased to be a dread of central-station engineers, yet occasionally conditions arise in which alternators misbehave when coupled. In these cases the whole subject is opened up afresh. In practically every case the trouble is to be found in the behavior of the engines or prime-movers, and not with the alternators, assuming the latter to be perfectly constructed.

It is evident, on consideration, that two similar alternators, each driven by a separate prime-mover at the same nominal speed, could not possibly run in parallel for any length of time if there were no electrical interaction between them tending to keep them in step. In the case, for instance, of 40-pole. 60-cycle alternators driven at 180 revs. per minute, one cycle would correspond to 18 degrees of shaft rotation, and an electrical phase-displacement of 20 degrees, or 1-18th of a cycle, would correspond to 1 degree of shaft-rotation. It would be impossible for the two independent engines to keep their respective alternator-shafts in unison to within 1 degree of shaft displacement, if it were not for the currents exchanged between the alternators through the bus-bars. Such local bus-bar currents are usually called idle currents, but they are very active in the sense of keeping the machines locked in unison. Moreover, any difference between the wave-shapes of the e. m. f.'s in the armatures coupled to common bus-bars must inevitably give rise to cross-currents or idle currents. As long as these currents are not of marked strength or periodic fluctuation they are useful and necessary. When they assume large proportions and fluctuate rapidly, they represent hunting between the machines, and may involve dangerous stresses either in the alternators, or in the prime movers, or both. Every alternator or synchronous motor possesses a natural period of oscillation when connected to constant-frequency and constant-potential mains. This period depends upon the moment of inertia of its rotor, and on the strength of the restoring electromagnetic torque which is set up per electrical degree of accidental phase displacement. The greater this restoring torque, and the smaller the rotor inertia, the shorter is this period. Many writers and experimenters have limited their enquiries to this natural electromagnetic period of alternator-oscillation, which may vary in different machines from say one-tenth of a second to ten seconds or more.

In an article by Dr. Gustav Benischke, recently printed in *Elektrotechnik und Maschinebau*, it is pointed out that no theory of alternator hunting can be complete without including the natural periods of the respective prime-movers. A mechanical model of the case is suggested, as presented by a pair of pendulums each driven flexibly through springs from a reciprocating element, but mechanically coupled by a cord carrying a certain weight. If the two pendulums have the same natural period of vibration, and if they are driven isochronously by similar reciprocations, in step, through like springs, then the coupling cord and weight will swing idly, with the weight neither rising nor falling. If, however, there be dissymmetry in any of the points specified, there will tend to be an up-and-down oscillatory motion of the intermediate weight on the coupling cord, corresponding to the cross-current through the bus-bars. In particular, if the period of oscillation of one or both prime-movers approaches the natural period of the pendulums or alternators, then very large perturbations of the weight may be looked for. This means that the natural period of the engines and governors must be kept away from the natural period of the alternators, and both should be damped as much as possible. The alternator damping is usually effected with the aid of eddy currents in the pole-faces of the alternator field-frames. The engine-governor damping is usually effected with the aid of a dash-pot on the governor mechanism.

Exhibits at the Chicago Electrical Show.

Elsewhere will be found an extended account of the exhibits at the Chicago Electrical Show this year, in which, for the convenience of the reader, the matter is classified and arranged in order that all the devices or appliances of a similar nature can be found together under a suitable head. Particular attention has been given to the new things brought out at this show or within the last few months, and only casual mention made as a matter of record of things which have been on the market for some time and which should be well known by readers of this journal. This marks somewhat of a departure from previous practice in reporting exhibitions, and, although involving considerably more work, will be appreciated by readers who have experienced the difficulty of attempting to find new devices among a number of columns of unclassified notes, burdened with invoices of staple articles.

Taken as a whole, the Chicago Electrical Show of 1908 has been well worth visiting from the standpoint of the electrical man looking for information of practical value, as new devices and improvements of old devices were to be found on every hand, as can be seen from the report we print.

The general appearance of the show this year was a great improvement over previous ones, because of the uniformity of the booth construction and decorative scheme, to say nothing of the elaborate decorative lighting. From the exhibitors' standpoint it was a relief to have the work of booth erection and moving in of exhibits all done by the Electrical Trades Exposition Company, which runs the show. The show was this year, as last, under the efficient management of Mr. Homer E. Niesz, of the Commonwealth Edison Company. The popular attendance was not as good this year as formerly, which, of course, was disappointing to the management, but it had at least the advantage that electrical men had better opportunity to look around without being crowded out by the general public, as was often the case the two previous shows.

Convention of the Northwestern Electrical Association.

The sixteenth annual convention of the Northwestern Electrical Association was held at Hotel Pfister, Milwaukee, Wis., Jan. 15 and 16. Abstracts of the most important papers and discussions will appear in a later issue. In the absence of President Edward Daniell, of Marinette, Wis., Mr. W. R. Putnam, of Red Wing, Minn., one of the members of the executive committee, presided at all sessions, proving a very efficient chairman. The report of Mr. R. N. Kimball, secretary and treasurer, was first heard. Invitations were read from the Chicago section of the Illuminating Engineering Society to attend a meeting of that organization at the Chicago Electrical Show, Jan. 17, and from the Allis-Chalmers Company to visit the works of that company. It was announced that the badge of the association would admit members of the convention to the Electrical Show on Jan. 17, and that arrangements had been made for special cars to take those attending the convention to Chicago to visit the Electrical Show after the adjournment of the convention. The Milwaukee Electric Railway & Light Company also invited the convention to inspect its very complete Public Service Building. This invitation was taken advantage of the following day, when the members visited the Public Service Building in a body and were shown its numerous interesting features by Messrs. Rau and Vaughn, of the Milwaukee Company. The nominating committee to nominate officers for the ensuing year was appointed, consisting of Mr. Irving P. Lord, Waupaca, Wis.; Mr. Ludwig Kemper, Albert Lea., Minn., and Mr. W. B. Jackson, of Chicago and Boston.

It was voted that hereafter the arrangement of programme should be in the hands of a committee, of which the president of the association shall be the chairman. In this way the practical responsibility for the success of any meeting will be in the hands of the president, and the secretary and treasurer will be relieved of some of his too burdensome duties. The chairman stated that there was a movement on foot in Minnesota to organize a Minnesota central station men's association. A meeting had been called for Minneapolis the latter part of February. Those Minnesota men who had been connected with the Northwestern Association felt that better results could be accomplished by having the Minnesota men belong to the Northwestern. Distances from Minnesota points to Milwaukee were considerable, but it might be possible to arrange alternate meetings in St. Paul or Minneapolis and Milwaukee. Mr. Kemper, of Albert Lea, also said he was opposed to establishing an association in Minnesota, where there was one already covering the Northwest. This opened up the question whether the association would better serve its members if limited to the state of Wisconsin in the future. Mr. Lord said that when the Northwestern Association was formed, central stations were not as numerous as now. As more central stations have been established, each state has become more of a unit. The necessity of each state looking after its own interests has become more apparent. Legislation has seemed to make that necessary. He thought it best for the interests of the different central stations in the states of Wisconsin, Minnesota, Illinois, Michigan and Iowa to have their own state associations; that they could accomplish more good in that way. While he had formed strong friendships with members from other states who had been at the conventions year after year, he was obliged to look at things as they are. He suggested that members from other states might be admitted as honorary members, and always welcome to take part in conventions. Mr. R. N. Kimball, secretary, said that the Wisconsin Electric & Interurban Railway Association was formed because it was decided that the Northwestern Electrical Association did not serve the purpose, because of the character of its membership. Mr. P. H. Korst expressed the opinion that the Northwestern Association could not hope in future to cover much more than the state of Wisconsin, and that the association interest would be a little closer if membership was taken exclusively from Wisconsin. In fact, on account of the Northwestern Association being composed of members from different states, it was necessary to organize another association last year to take up matters pertaining to the state alone, so that now there were two associations in the state. He did not favor excluding members from other states, but thought it would be well to have the organization such that there would be no delicacy about taking action which interested the Wisconsin members only.

Mr. Clement C. Smith, of the Wisconsin Electric and Interurban Railway Association, said that his association dealt with legislative and accounting questions and did not cover the same field as the Northwestern, but if the Northwestern should decide to confine itself to Wisconsin, he did not see why the two associations could not be together, and perhaps make a stronger organization. His association had about 25 companies as members, one-third of which were street railways purely; one-third combined street railway and lighting, and one-third purely electric lighting. The matter was laid over for discussion the following day, and in the meantime an informal meeting of the Wisconsin Electric and Interurban Railway Association was held, at which the same matter of possible consolidation was discussed. At this meeting, a committee consisting of Mr. P. H. Korst, of the Janesville Electric Company (a lighting property), and Mr. Irving P. Lord, of the Waupaca Electric Light & Railway Company, were appointed a committee to revise the constitution and make arrangements for consolidation with the Northwestern Electrical Association. The next day when the matter came up for discussion in the Northwestern Association, it was voted to appoint a committee to confer with the Wisconsin Electric and Interurban Railway Association committee and to report at the next meeting. This meeting is to be, if possible, a joint meeting of the two associations, and the committees are expected to recommend some plan to merge the two associations. A committee consisting of Mr. John S. Allen, of Lake Geneva, and Mr. W. B. Voth, of Sheboygan, was ap-

pointed. It was also voted that the sense of the meeting was that the organization be not limited to Wisconsin.

A communication was received from the secretary of the railroad commission of Wisconsin, submitting a tentative classification of accounts upon which the commission wished to receive suggestions and expressing a desire to meet with a committee of the association as soon as the January hearings of the commission are over. Mr. B. L. Parker, of Green Bay, Wis., president of the Wisconsin Electric & Interurban Railway Association, and Mr. C. C. Smith, secretary of the association, spoke in reference to the accounting system matter and favored having committees for representing the associations before the commission. It was decided to leave the matter of a committee to co-operate with the railway commission with the officers of the two associations. A question was brought up by a member as to what advantages, if any, were to be derived by a Wisconsin public service company in giving up its franchise and putting itself under the care of the state commission by operating under an indeterminate permit. This question was discussed at some length both in this session and in a later one. The principal immediate, tangible advantage stated was that a company operating under an indeterminate permit is assured against unfair or unreasonable competition, as no competing plant can be established in the same town without a careful investigation by the railroad commission and a decision that the existing company is not able or willing to properly serve the community.

At the opening of the Wednesday afternoon session, the convention listened to a paper by Mr. C. N. Duffy, comptroller of the Milwaukee Electric Railway & Light Company, on "Depreciation." This was discussed by Messrs. W. B. Jackson, R. N. Kimball, P. H. Korst and J. H. Harding. This is a matter of special interest at this time because of the valuation of Wisconsin properties being made by the Wisconsin commission. After this discussion, Mr. Errett L. Callahan, of the General Electric Company, presented a paper on "Central-station Load That Pays," in which he took up heating devices. This was discussed by Messrs. J. R. Cravath, of Chicago; J. H. Harding, of La Porte; P. H. Korst, of Janesville; E. F. Strong, of Chaska, Wis.; Ludwig Kemper, of Albert Lea, Minn.; and W. B. Jackson, of Chicago. Mr. W. R. Putnam, of Red Wing, Minn., chairman of the meeting, presented his paper on "The Public's Debt to the Public Service Corporation," which opened up a discussion on the matter of general treatment of the public and complaints. Mr. Neal Brown, of Wausaw, addressed the convention by request on the "Public Utilities Bill." It was announced that the Wisconsin Electric & Interurban Railway Association had appointed the following committee on accounting: H. D. Smith, of Appleton; B. G. Brood, of Sheboygan; and P. H. Korst, of Janesville. The chairman appointed a similar committee from the Northwestern Association to consist of C. N. Duffy, of Milwaukee; B. W. Lyon, of Beloit; and R. N. Kimball, of Kenosha. Thursday morning the convention took up a paper by J. L. Hecht, of the North Shore Electric Company, Chicago, entitled "Steam Notes on a Turbine Plant," which was a very clear, simple explanation of some of the fundamental thermodynamic principles underlying the steam turbine. Mr. C. W. Pendell, of the same company, presented a paper entitled "Electric Notes on Small Steam Turbine Plants." Both these papers received a good discussion. The convention then adjourned to visit the Public Service Building, which is undoubtedly the most complete thing of the kind in the United States. In the basement is a plant supplying exhaust steam heating in the down-town district during the winter season from three 1500-kw steam turbines. These steam turbines drive alternators which operate motor-generator sets feeding into the direct-current, three-wire network in the down-town district. Steam turbines were used to get the necessary capacity in the limited basement space. Steam is supplied from 5000-hp Edgemore boilers without steam drums, as the headroom in the basement is not sufficient to permit steam drums being used. The operation has been entirely satisfactory. Other things of interest about the building which were visited were the lighting department, storage rooms, display and sales room, physical and chemical testing laboratories, meter testing department, auditorium, company surgeon's office and operating room, general offices, printing office, machine shop, interurban waiting-room and interurban car house and car storage.

On Thursday Mr. Irving P. Lord, of Waupaca, read a brief paper on "Electric Lighting in Villages of 3000 People and Under." This met with considerable discussion and was followed by a paper by Mr. F. L. Kaufman, of Beloit, on "Recent Developments in Single-Phase, Variable-Speed Motors." After the discussion on this paper, several questions from the question box were taken up.

The election of officers resulted as follows: President, P. H. Korst, of Janesville, Wis.; first vice-president, Mr. John Wright, of Antigo, Wis.; second vice-president, Mr. John S. Allen, of Lake Geneva, Wis.; secretary and treasurer, Roger N. Kimball, of Kenosha, Wis. Directors: Messrs. John H. Harding, La Porte; P. V. Elevier, Superior, Wis.; Mr. L. L. Tessier, Depere, Wis.

Mr. P. H. Korst, the new president of the Northwestern Electrical Association, was one of the charter members of that association and has always been a faithful worker in the asso-

PRES. P. H. KORST.

ciation's ranks. He was born 45 years ago at Chillicothe, Ohio. After leaving high school in 1880, he engaged in telephone work, and later became an arc expert for the Wood arc system. He took the Thomson-Houston factory expert course in 1888, after which he became manager and secretary of the Badger Electric Company at Racine, Wis. He remained at Racine 11 years until the sale of the property to the Milwaukee system. For eight years he has been manager of the Janesville Electric Company, which has been built up into one of the finest small properties of the state, having three water power plants and a large power business. Under the new arrangement the president of the association is responsible for the programme of the convention at which he presides. Mr. Korst's well-known ability to carry out, thoroughly and faithfully, work falling to his lot, gives the members of the association the assurance that next year's convention will be a notable one. The association is especially in need of careful piloting at this time when the matter of consolidation with the Wisconsin Electric and Interurban Railway Association is under consideration, and it is desired to make the association more effective in Wisconsin without lessening its value to members outside of Wisconsin.

Chinese Telephony.

Advices to Washington state that the subscribers to the telephone system in Peking are now about 1700, and the demand for connections is more than the administration can keep pace with. At least 100 new subscribers were awaiting the installation of service.

Dinner to Messrs. Charles Kirchhoff, T. C. Martin and Rev. Percy S. Grant.

As a recognition of the honor of the bestowal by the French Government of the decoration of *Officier de l'Instruction Publique* on Mr. Charles Kirchhoff, editor of *Iron Age;* Mr. T. Commerford Martin, editor of ELECTRICAL WORLD; and Rev. Percy Stickney Grant, rector of the Church of Ascension, New York City, all of whom are members of its Board of Direction, the American Museum of Safety Devices gave a dinner at the Aldine Club, New York, on January 15. Hon. Elbert H. Gary, of the United States Steel Corporation, presided at the dinner, for which more than 200 covers were laid.

Following the speech of presentation by Mr. John La Farge, the artist, on behalf of the acting French Consul General, M. Bonzon, the several guests of honor were introduced to the assemblage. In each case the sponsor for the guest was one who had known him throughout his whole professional life.

The introduction of Mr. Kirchhoff was assigned to Mr. Wm B. Dickson, vice-president of the United States Steel Corporation, who remarked that to all men connected with the production and utilization of iron in any form, Mr. Kirchhoff needed no introduction, because he had been a foremost figure in the iron industry for many years, and had been editor of the leading paper in its field for more than 30 years.

Mr. Frank J. Sprague outlined the career of Mr. Martin from the days of his association with Mr. Edison in 1877-1879, through his presidency of the American Institute of Electrical Engineers, of the New York Electrical Society, and of the Engineers' Club of New York, and commented upon his great influence during his 25 years of service as editor of the ELECTRICAL WORLD.

Bishop Henry C. Potter in introducing Rev. Percy Stickney Grant pointed to the excellent work for humanity that is now being done by the ministers who appreciate the existing conditions of mankind under modern social and industrial influences, and stated the Rev. Grant has always been a leader in such work.

What otherwise would have been the difficult task of replying to an embarrassing introduction was appropriately turned by each honor guest into a delightful privilege of calling attention to the work assumed by the American Museum of Safety Devices of educating the employer to place more value upon the lives of his employees.

The concluding speech was made by Dr. Josiah Strong, president of the American Institute of Social Service, who in a convincing manner told of the enormous and unnecessary loss of life due to the lack of proper recognition of the avoidable risks in our modern industrial life.

A handsome 44-page brochure contained inserted engraved portraits of the several guests of the evening, accompanied by sketches of their professional careers. The greater part of the remaining space is given up to letters of congratulation and compliment. Among the writers of these are Mr. Andrew Carnegie, General Horace Porter and President Hugh Bell, and Past-President Robert A. Hadfield, of the Iron and Steel Institute of Great Britain, who coupled the names of Mr. Kirchhoff and Mr. Martin. Tributes to Mr. Martin alone appear from Mr. Gugliemo Marconi, Prof. W. E. Ayrton of London, Prof. André Blondel of Paris, and Dr. Wilhelm von Siemens of Berlin. Tributes to Rev. Mr. Grant were offered by Bishop Potter, President Eliot of Harvard, Mr. Richard Watson Gilder and Rev. George Hodges, and Mr. Robert Underwood Johnson contributed a poem in his honor, which was printed in fac-simile.

The final pages of the pamphlet are devoted to an account of the organization and work of the American Museum of Safety Devices and Industrial Hygiene, and announcements of prizes as follows: A gold medal annually for the best device for protecting life and limb; a gold medal, limited to the field of motor vehicles and motor boats; a prize of $100 for the best essay on "The Economic Waste Due to Occupational Diseases"; a prize of $100 for the best essay on "Economic Waste Due to Accidents." Several days after the dinner Mr. S. C. Dunham, president of the Travelers' Insurance Company of Hartford, who was a guest at the dinner, announced on behalf of his company, the offer of a gold medal, the conditions of award to be left to the council of the Museum.

Westinghouse Readjustment Plan.

The committee of creditors of the Westinghouse Electric & Manufacturing Company, consisting of James N. Jarvie, chairman, New York City; A. G. Becker, Chicago, Ill.; Richard Dalafield, New York City; Charles A. Moore, New York City; Neal Rantoul, Boston, Mass.; F. H. Skelding, Pittsburg, Pa.; and Albert Wiggin, New York City, representing holders of a large amount of the debt of the Westinghouse company, completed this week plans for the readjustment of the company's debt. The report of the plans announces that, according to the statements of Haskins and Sells, the company's auditors, the present unsecured indebtedness of the company, exclusive of interest, is as follows:

Convertible Sinking Fund, five per cent gold bonds, due Jan. 1, 1931	$18,500,000.00
Five per cent gold debenture certificates, due July 1, 1913	1,969,000.00
Bills payable	9,209,766.21
Accounts payable, about	3,952,843.13
Indebtedness of subsidiary companies, subscriptions to stocks or bonds of subsidiary companies and endorsements of notes of subsidiary companies and other obligations, for which provisions should be made, about	1,368,390.66
Total floating debt, about	$14,531,000.00
Total unsecured debt to be provided for, about	$35,000,000.00

The debt secured by collateral consists of:

Three-year six per cent collateral notes, due Aug. 1, 1910	$6,000,000
Ten-year five per cent collateral notes (French loan), due Oct. 1, 1917, about	2,750,000
Total secured debt, about	$8,750,000

It is proposed to create an issue of $35,000,000 first mortgage and collateral trust five per cent 25 year gold bonds, secured by a first mortgage upon the principal manufacturing plants of the company and by the pledge of the greater part of the company's unpledged stocks and bonds of subsidiary and other companies. Of such issue of bonds an amount not exceeding $20,469,000, face value, is to be convertible at the option of the holder or registered owner, after Jan. 1, 1910, upon such terms and conditions as shall be provided in the deed of trust. The deed of trust will provide for sinking fund payments and will further provide that the collateral notes mentioned above as debt secured by collateral shall be retired at or before maturity, and provision will be made in the deed that, as to any deficiency, holders of collateral notes may share pro rata with the holders of the new bonds in the property covered by the lien of the mortgage. The distribution of the first mortgage and collateral trust bonds at par will be as follows:

For existing convertible bonds (these bonds to be convertible into stock)	$18,500,000
For existing debenture certificates (depositors of certificates to have the right of election as between convertible and non-convertible bonds)	1,969,000
For floating debt, say	14,531,000
Total	$35,000,000

Holders of the three-year six per cent collateral notes of the issue of $6,000,000, maturing Aug. 1, 1910, and also (if they shall so elect) the holders of the issue of 14,000,000 francs of 10-year five per cent collateral notes, due Oct. 1, 1917, are to exchange them for new or modified notes of the same maturity and bearing the same interest, with modified provision for collateral and with the right to participate in the case of deficiency pro rata with the holders of the new bonds in the lien on the property covered by the mortgage, as set forth in the plan and agreement. Unless otherwise determined by the committee, the consummation of the plan is to be conditioned upon subscriptions for the payment of $7,000,000 new capital into the treasury of the company for stock. It is understood that this is being provided.

Telephone Convention in Chicago.

During the current week, in Chicago, at the Coliseum Annex, the International Independent Telephone Association will hold its annual convention, there being prospect of a large attendance, as the meeting is held at the same time as the Electrical Show. During the convention, the following papers will be presented:

"The Independence of the Independents," W. H. Denlinger, Patton, Pa.

"Independent Toll Lines," Albert Parlett, Bristol, Va.

"How to Raise Rates," L. A. Herrick, Freeport, Ill.

"Business Methods in the Telephone Business," C. H. Cheadle, Joliet, Ill.

"The District, State and International Associations," A. C. Lindemuth, Richmond, Ind.

"Best Methods of Enlarging Association Work," Manford Savage, Champaign, Ill.

"Practical Advertising—Boosting the Shield," W. H. Caman, Beatrice, Neb.

"Independent Requirements in Canada," L. Page Wilson, Toronto, Canada.

"Where the Money Comes From," Chas. West, Allentown, Pa.

"Depreciation of Telephone Properties as Compared with Other Public Utility Corporations," Geo. S. Shanklin, Lexington, Ky.

"Financing Methods to Meet Modern Requirements," L. W. Stanton, Cleveland, Ohio.

"Equitable Charges for Telephone Service," W. H. Crumb, Chicago, Ill.

"The Business End of the Business," James H. Shoemaker, Waterloo, Ia.

"What is Your Telephone Directory Worth?" W. A. Wadsworth, Chicago, Ill.

"Telephone Investments—Quit Knocking—Boost!" Max Koehler, St. Louis, Mo.

"Combating the Sub-License Company," Frank L. Beam, Columbus, Ohio.

"How the State Directory Helps Business," R. E. Mattison, Lincoln, Neb.

"Telephone Directories," C. B. Johnston, Columbus, Ohio.

"All Cable Plant—Reducing Cost of Maintenance," J. K. Johnston, Sandusky, Ohio.

"Economy in Perfect Company Organization," F. D. Houck, Harrisburg, Pa.

"Solution of the Telephone Situation," R. Max Eaton, Niagara Falls, N. Y.

"The Bankers' Opinion of Securities," E. H. Moulton, Minneapolis, Minn.

"Toll Line Advertising," J. B. Earle, Waco, Tex.

"Aerial and Underground Construction," C. H. Judson, Seattle, Wash.

"Winning Home Support in New Fields," T. S. Lane, Butte, Mont.

"The Mistake of Giving Free Toll Service," Frank E. Ebersole, Portland, Maine.

"The Situation in the South Atlantic States—The Reason," E. S. Moorer, Anderson, S. C.

"Relation of Cost of Service to Quality," John E. Casey, St. Louis, Mo.

"Telegraphing Over Telephone Wires—Money-Making Possibilities," C. Y. McVey, Cleveland, Ohio.

"Electrolysis—Cost and Prevention," C. H. Ledlie, St. Louis.

"Joint Occupation of Pole Lines," C. E. Tarte, Grand Rapids, Mich.

"Hotel Branch Exchanges," A. H. Cowie, Syracuse, N. Y.

"Slot Machines and Pay Station Signs," O. F. French, Winnipeg, Man., Can.

"Why the National Grange Favors Competition," Geo. W. F. Gaunt, Mullica, N. J.

During the convention, various important aspects of independent policy will also be discussed.

Westinghouse Company to Operate N. Y., N. H. & H. Electric Equipment.

On Wednesday morning of last week, Jan. 15, the Westinghouse Electric & Manufacturing Company placed its own men in charge of the operation of the New York, New Haven & Hartford Railroad's electrical equipment on the New York Division, extending from Woodlawn to a point 1½ miles beyond Stamford, Conn., a distance of 32 miles. In a statement issued from the offices of the Westinghouse company, it is pointed out that this does not mean that the railroad has raised any serious objection to the working equipment. The relations of the two companies were stated to be entirely harmonious, and it was at the request of the New Haven's executives that the Westinghouse Company furnished experts to assist their employees in overcoming the minor conditions of operation that have been encountered. It was denied that any serious defect exists in the equipment, and asserted that no complaints of an official nature have been made to the effect that in actual operation the equipment has not met the requirements of the contract. President Mellen authorized the statement that ever since the installation of the electric service on the New York Division of the New Haven system, the Westinghouse company has had supervision of its operation and maintenance and would continue such supervision. It has been reported that this action means that an agreement has been reached between the purchaser and the manufacturer whereby a demonstration will be made for the purpose of securing a final basis for financial settlement, this demonstration to extend over a period of six months. No official utterance, however, in support of this view of the operating arrangement has been made.

Objections to the Wireless Convention.

Last week, at Washington, Mr. John W. Griggs, counsel for the Marconi Wireless Telegraph Company submitted before the Senate Committee on Foreign Relations, a memorandum of objections of the company to the confirmation of the Berlin international wireless convention of 1906. The document says, in part:

"The convention makes it obligatory upon private enterprises like the Marconi Company to exchange wireless telegrams with all other ships and stations without distinction of wireless telegraph systems adopted by such ships or stations, and without regard to whether any business or commercial arrangement of interchange of traffic has been made or not.

"The arrangement thus proposed represents an enforced partnership to which the Marconi companies contribute everything and the German manufacturers of wireless apparatus nothing, neither invention nor capital, nor skilful enterprise. In short, the German company proposes to obtain artificially, through international legislation, the advantage of the position obtained by the Marconi companies in open competition and by private effort at private expense."

In discussing the matter with a representative of ELECTRICAL WORLD, Mr. John Bottomley, secretary of the company, said: "There are inherent faults in the regulations. They were drawn up by a group of army and navy men, and, to my mind, they do not seem impartial for they bring the government into the field of commercial enterprise, which has always been contrary to governmental policy heretofore. We have spent seven years and a large amount of capital in obtaining our patents and perfecting our organization, both here and abroad, and now the convention comes along and proposes to make us accept messages from any vessel that cares to send them. We are to be compelled to pay land tolls with no guarantee against possible loss, and the regulations offer great inducements for outsiders to manufacture our products and sell them, notwithstanding the fact that our inventions are protected by patent rights. It is proposed to establish but two wave lengths of 300 and 600

meters, thereby rendering certain of our stations useless. The regulations of the convention, besides being unfair, are, under our commercial treaties with the leading foreign powers, unnecessary."

An Investigation of New York Electric Lighting Conditions.

For some time past there has been talk of an investigation of electric lighting conditions in Greater New York, the initiative coming from the Public Service Commission. An effort was made to get the Merchants' Association to move in the matter, but that body has declined to do so, for lack of reason and justification, except in regard to the question of "breakdown connections," upon which point it held that the policy of the New York Edison Company should be more liberal. The Public Service Commission, on the motion of its member, Mr. Milo R. Maltbie, has now taken up the subject, and at an early date will examine into the franchises, property and operations of the New York Edison Company, Brush Electric Illuminating Company, Fleischauer Electric Light & Power Company, United Electric Light & Power Company, West Side Electric Company, Long Acre Electric Light & Power Company, Edison Electric Illuminating Company, Kings County Electric Light & Power Company, Amsterdam Light, Heat & Power Company, Flatbush Gas Company, Westchester Lighting Company, Bronx Gas & Electric Company, New York & Queens Electric Light & Power Company, Queens Borough Gas & Electric Company, Richmond Light & Railroad Company, and also the Consolidated Telegraph & Electrical Subway Company, and Empire City Subway Company, Limited, and any other company engaged in the business of producing and selling electricity for light, heat or power, and having authority to maintain wires, conduits, ducts or other fixtures in, over or under any streets, highways or public places in the city of New York. It will also investigate the subject of rates and the general conditions of service. The resolution, according to an official statement of Mr. A. S. Blackman, counsel to the commission, does not involve an inquiry into the organization and capitalization of the companies. Indeed, the counsel points out that the commission is very limited by the law in its power of inquiry on its own motion or in fixing maximum rates.

In the meantime, Mr. N. F. Brady, vice-president of the New York Edison Company, has addressed a letter to the commission on the subject of break-down or reserve service charges, in which he points out that instantaneous "readiness to serve" and reliability of service are not accomplished without large operating and maintenance costs as well as fixed charges—all of which the private-plant operator desires to have available for himself without paying even the bare expense to which the company is subjected in maintaining the service.

The company has now made a "service rate" irrespective of any current that may be consumed, with the further provision that this charge may be exhausted in the use of current at the best prevailing rate, without additional cost to the consumer. In view of the great importance of this subject, the full memorandum is given below:

"It is understood that break-down connections shall be furnished to any applicant operating a private plant on the following basis:

"(a) A service charge of $30 annually for each kilowatt of installation that under any arrangement of wires, switches or other devices can be connected with the service of the company.

"(b) This does not refer to any installation or part of installation permanently segregated from the private plant and connecting directly with the service of the company. Such installation may be supplied under direct contract at the best rates obtainable by any consumer under like conditions using an equal amount of current.

"(c) In rating the installation each 16-cp standard incandescent lamp should be taken as the equivalent of 50 watts; 8-cp lamps and others of other sizes shall have a proportional rating based on their candle-power; each arc lamp shall be rated at 10—16 candle equivalents; each horse-power at 15 equivalents.

"(d) Within the service charge of $30 annually, the customer may consume electric current at the best rates obtainable in his class, without additional charge.

"(e) In all instances the customer is to provide incandescent lamps for the original installation, and renewals and carbons and trimming, and for the maintenance of any arc lamps. The company assumes no responsibility for the installation.

"(f) Service connections will be carried within the building at the vault or building line, as the company may determine. Meters will be installed at this point. Beyond this point, connections must be provided by the consumer in the usual manner. At or near the plant switchboard a throw-over switch must be installed, insuring absolute electrical separation of the plant and the Edison supply."

Marseilles International Electrical Exhibition.

As has previously been noted in these columns, an International Exhibition of the Applications of Electricity will be held in Marseilles, France, beginning April 19 of next year and continuing until Oct. 31. The city of Marseilles has placed at the disposition of the Exhibition its great park, "Rond Point du Prado," of 60 acres. The park was the site of a very successful French Colonial Exposition in 1906, and contains a "Grand Palais" and other buildings suitable for exposition purposes, which will, however, be supplemented by a number of new structures.

The exhibition, it is said, has the support of the municipality of Marseilles and of the government of the department in which it is situated. The president is the mayor of Marseilles and the two vice-presidents are the chief officials of the Department des Bouches-du-Rhone and the Marseilles Chamber of Commerce. Features of the exhibition will be brilliantly illuminated evening fêtes, with luminous fountains, and a large amusement section. Among the branches to which special attention will be paid are applications to agriculture, to domestic economy, art, etc., these being in addition to the usual departments of electrical engineering that will be largely represented. A particularly large space has been given up to electric traction, and in the department of agriculture applications to irrigation will be made a feature.

The exhibition has established a bureau in New York in the Park Row Building, in charge of M. Paul Diény, commissioner for the United States, who will supply information in detail concerning the exhibition.

New York Electrical Show.

The second annual New York Electrical Show will be held in Madison Square Garden Oct. 3 to Oct. 14 inclusive. It is stated that 60 per cent of the floor space has already been taken, having been sold to proposed exhibitors before the close of the 1907 show.

The directors of Electrical Show Inc. are as follows: Mr. Dudley Farrand, general manager of Public Service Corporation of New Jersey, and president National Electric Light Association; Mr. Arthur Williams, general inspector New York Edison Company and president Illuminating Engineering Society; Mr. W. W. Freeman, vice-president Brooklyn Edison Company; Mr. James R. Strong, president Tucker Electric Construction Company and president National Electrical Contractors' Association; Mr. James C. Young, secretary Madison Square Garden Company; Mr. George F. Parker and Mr. Walter Neumuller.

N. E. L. A. Membership.

Eleven applications from central stations for membership in the National Electric Light Association have been received since the December report, and also 14 applications for individual membership.

CURRENT NEWS AND NOTES.

NOT AUTHORIZED.—We wish to notify all whom it may concern that W. Tomson Hunt is not in our employ, and that he is not authorized to solicit or accept subscriptions, or to collect money for this journal.

NAVY YARD WIRELESS.—The chief electrician of the Brooklyn Navy Yard has received four complete sets of the Poulsen wireless apparatus, and later on various experiments are to be made with them.

SUFFICIENTLY CONCENTRATED.—In a recent speech, Secretary of War Taft, discussing adversely the proposition of government ownership, said: "Think what would happen if all those vast powers which would go with government ownership were put in the hands of a few men at Washington. Lord knows the powers are sufficiently concentrated there now."

A MOVING ELECTRIC SIGN.—A very effective advertisement seen running about the streets of Chicago during the Electrical Show was an automobile delivery wagon with an electric sign occupying the full area of each side with the words "Electric Show at Coliseum." The effect of this wagon going along a street at night was startling, even to the most hardened city resident, who is supposed to have become accustomed to all sorts of unusual sights and sounds.

AUTOMATIC SYNCHRONIZER.—A patent issued Jan. 14 to Prof. Morgan Brooks and Mr. M. K. Akers relates to the method of causing an incoming alternator to drop into "step" with the system automatically by using an impedance coil across the main-line switch. The impedance coils are designed so as never to allow excessive current to be produced in the incoming generator, even at opposition of phase, and yet to permit enough current to synchronize the generator and to maintain it in synchronism.

CONDUIT SYSTEM FOR ELMIRA.—Mr. J. Walter Ackerman, as expert conduit engineer and constructor for Commissioner Buchanan, has submitted to the Common Council of the city of Elmira, N. Y., a report on a project for a municipal electric conduit system. It is the intention to provide conduits throughout the city for the burial of all existing overhead electric wires. It is estimated that a system containing about 382,000 duct-feet and 150 standard manholes will cost $80,000. The rental for duct space at 5 cts. per duct-foot per year for about 50 per cent of the total system would amount to $9,550 per year.

RAILWAY OPERATING MEN'S ASSOCIATION.—The executive committee of the American Street & Interurban Railway Association will consider at a meeting to be held Jan. 30 the organization of a fourth association to be affiliated with the parent body. The object is to bring together in an affiliated organization general managers, managers, passenger agents, advertising managers, superintendents and other operating officials for the consideration of problems of interest to those engaged in the actual operation of street and interurban railway properties. The exact name of the new association will be determined at the organization meeting.

A TELHARMONIUM VISIT.—On Saturday, Jan. 18, the Pratt Electrical Association, composed of members of the senior class in applied electricity at Pratt Institute, Brooklyn, N. Y., paid an interesting visit to the first central station of the Cahill Telharmonic Company, at Thirty-ninth Street and Broadway, New York City. The dynamo room, with its 145 alternating-current generators, the transformer room, the new piano-key switchboard, and the oscillograph photographs, showing the various sine waves, fundamentals, harmonies, etc., which are mixed in the transformers to produce the desired tones, came in for a due share of attention. A programme of music was also rendered with experiments.

GERMAN WIRELESS REGULATION.—A bill to organize the business of wireless telegraphy in accordance with the decisions reached by the International Commission which sat in Berlin in 1903, and the International Congress which was held in 1906, was introduced in the Reichstag on Jan. 21 by the minister of posts and telegraphs. The fundamental principle of the measure is to compel navigation companies, as well as the owners of land wireless telegraphy stations, to arrange for intercommunication without regard to the system used; otherwise permission for the erection of stations for the use of wireless telegraphy on board of ships will not be given. The minister said that the enactment was intended to give the fullest scope to all systems.

TRANSATLANTIC WIRELESS.—Plans are under consideration by the Marconi Wireless Company for the opening of a new transatlantic station in the near future. As yet no definite steps have been taken in the matter, but vice-president Bottomley announces that it is intended to build the new station at some point along the coast or in the vicinity of New York City. Mr. Bottomley states that the experimental station at Glace Bay, Nova Scotia, which has been transmitting and receiving transatlantic messages since last October, has proved successful beyond all expectations, averaging between 5000 and 6000 words daily. A large part of the business has been newspaper dispatches, but numerous private messages have been sent, and the steady increase of the business will shortly necessitate operating the station day and night.

STEAM RAILWAYS IN BOSTON.—In the annual report of the Massachusetts Railroad Commissioners the remark is made: "The source to which the public may rightfully look for final relief from the smoke nuisance is the use of electricity as a motive power and the abandonment of steam locomotives. The recent successful installation of electricity on railroads in this country and in foreign countries has removed all doubt as to the practicability of its use for the transportation of passengers. There only remains for demonstration the type to be installed which will provide the public with a safe and reliable service at the lowest cost obtainable. The time is fast approaching when electricity as a motive power must be installed on railroads operating in and about Boston, at least, and to that end the work of preliminary investigation should be consummated, that the situation may eventually be met with intelligence and despatch. We therefore recommend further that studies be prosecuted and completed at the earliest possible date relative to the whole question of electric installation."

ILLUMINATING ENGINEERING.—The January meeting of the Chicago Section of the Illuminating Engineering Society was held at the Coliseum Electrical Show, in Chicago, Jan. 17. Chairman George C. Keech presided. The subject of the meeting was "The Gas and Electric Lighting of Apartments and Small Houses." The discussion was opened by Mr. George H. Jones, of the Commonwealth Edison Company, who read a description of the electrical features of the "House Electrical," which his company had erected in the Electrical Show to furnish to the public examples of electric lighting and the use of other electrical appliances. The discussion was taken part in by Messrs. Albert Scheible, E. W. Lloyd, W. R. Bonham, J. R. Cravath, G. H. Stickney, Ludwig Kemper, J. M. Strasser, W. R. Putnam, H. V. von Holst, C. R. Gilman, C. A. Howe, and others. Members of the Northwestern Electrical Association who were visiting the Electrical Show on that day, were invited to the meeting. The election of officers for the section for 1908 resulted as follows: Chairman, Mr. J. R. Cravath, of the ELECTRICAL WORLD; secretary, Mr. George H. Jones, of the Commonwealth Edison Company; managers, Mr. Frederick J. Pearson, electrical engineer of Marshall Field & Company, and Mr. H. V. von Holst, architect.

ELECTRICAL PATENTS.—U. S. Consul-General Richard Guenther sends from Frankfort some statistics prepared by a German publication showing that about 5000 electro-technical patents were taken out in various countries in 1906. The United States is credited with 2050, United Kingdom and colonies with 750, Germany 700, France 400, Austria 200, Italy 180, Hungary 130, and Switzerland with 120.

DETROIT CAR FARES.—At Detroit, Mich., Mayor Thompson, in his message to the Common Council, referring to the early expiration of many street railway franchises there, declared the roads can obtain "no new lease of life except upon the fundamental basis of 3-cent fares for all the people all the time," the latter clause referring to the present plan of cheap tickets for workingmen for certain hours of the day.

TELEPHONY IN SOUTH DAKOTA.—At a recent meeting of the South Dakota Telephone Association, at Mitchell, S. D., Secretary Buck presented a report and gave the statistics of the telephone business of the state as between the Bell and the independent companies. The Bell people, he stated, have approximately 400 miles of toll lines in the state, valued at $100,000; they have 17 exchanges, with 3764 phones installed, valued at $282,300. The independent companies own and operate between 6000 and 7000 miles of toll lines, valued at $1,000,000, with 405 exchanges with 32,000 phones installed and valued at $1,900,000.

STOCK TICKER SYSTEM.—A patent has been issued to Mr. John C. Barclay, assistant general manager and electrical engineer of the Western Union Telegraph Company, on an improvement in stock-ticker systems. The purpose of the invention is to provide means whereby the transmitter of a stock-ticker system in one city or locality may operate a similar system in another city or locality, the two systems being connected by a single line. The usual local transmitting and translating devices are employed, in combination with polar and neutral relays, which relays regulate the electrical impulses transmitted to the line as to sequence, duration, etc. As the impulses are received they are differentiated by means of similar instruments, thus causing the receiving instruments to perform their various operations.

PROTECTIVE TARIFF LEAGUE.—At the annual meeting in New York City last week, resolutions condemning the German Tariff Trade Agreement were adopted by the American Protective Tariff League. They declared it injurious to American labor, unfair to the honest American importer who buys in the foreign market and makes entry at the price he is compelled to pay, demoralizing to the customs service generally, and in effect a material and indiscriminate reduction in the tariff which should be made only after hearings granted, and then by the legislative branch of the government. The legality of the greater part of the agreement was also called in question and the opinion was expressed that the courts would hold it void. These officers were elected: President, Charles A. Moore; first vice-president, William F. Draper; second vice-president, John E. Reyburn; treasurer and general secretary, Wilbur F. Wakeman. Board of Managers: John Hopewell, Massachusetts; Charles Cheney, Connecticut; William F. Draper, Massachusetts; A. D. Juilliard, New York; Theodore H. Ives, New York; and Joseph R. Grundy, Pennsylvania.

WIRELESS IN CANADA.—The Dominion Government has been spending a large amount of money on the Pacific Coast in improving the telephone systems and installing wireless telegraphic systems so that in a short time all the principal points will be connected by some means of communication, proving a great and valuable aid to navigation. After completing the laying of the telephone lines between Union Bay and Dennan Island, Horby and Dennan Island, and Beaver Point, Salt Spring Island and Pender Island, the public works tug Petrel has returned to Victoria, British Columbia. During the work several miles of sea cable was laid, making the task of connecting the above islands comparatively easy work. The wireless telegraph system recently installed is proving successful in communicating with overland stations which, at first, seemed doubtful. It was expected that Pachena and Victoria would have to talk through the United States station at Tatooshe, owing to the mountain intervening. This has not been the case, however, as communication has been regularly carried on between the two stations. A new and unexpected record was recently made when the operator at Victoria picked up a message from the steamer Portland which was waiting for tide in Seymour Narrows. This message crossed a high range of mountains.

TECHNICAL TRADE EDUCATION.—In a recent public utterance Mr. Richard T. Crane, president of the Crane Company, Chicago, attacked modern technical education, stating that Mr. Andrew Carnegie might as well have thrown in a lake the millions of dollars with which he built and endowed the Carnegie Technical Schools in Pittsburg. Mr. Carnegie has made public the following pleasant and pretty reply addressed to Mr. Crane: "I have little time to devote to the defense of technical education. I do not think it needs any. It is speaking for itself, and will speak for itself, and even you will be satisfied by and by that we are on the right path. You asked me four questions. To the first I answer that when I started in business I did not know of one technically educated mechanic, but several families in Pittsburg were sending their young men to Troy, and especially to Boston. One of them happened to be a near relative, and he has made a great success, and is a partner now in one of the leading firms for special steels. I do not believe that he would have achieved this so rapidly had it not been for his superior education. If I were in business to-day the young man whom I would take into my service would be the most highly educated mechanic. This answers all four of your questions, and I should like to ask you one in return. The apprenticeship system is a thing of the past. What do you propose as a substitute? The best one, and the one better than the original, is to give instructions to young men in technical schools."

RAMSAY ON RADIUM.—In his recent Royal Society of Arts address on "A Radio-Active Gas," Sir William Ramsay gave some forcible illustrations of power of the wonderful substance called radium. Twelve grains of radium, he said, emitted enough heat to evaporate a pound of water every hour. A ton would boil away 200 pounds of water every hour, and would serve as efficient fuel to warm a house, do all the cooking, and afford plenty of hot baths for a large family, not only during their own lives, but would continue to perform these useful functions for about 20 generations without falling off. "One grain of radium," he said, "emits each hour enough heat to raise a grain of water through 100 degrees, and one grain of emanation enough to melt a grain of ice." Radium emanation changes into helium and "something else," and if dissolved in water it decomposes the water into oxygen and hydrogen. On removing the oxygen and hydrogen there is left neon, another of the inactive atmospheric gases which Sir William Ramsay and Dr. Travers discovered. Similarly radium in the presence of copper produced lithium, potassium, and sodium. Sir William, therefore, suggested that it seemed we were in the presence of the transmutation of copper into a lower element than itself. "It is probable, though not proved," he said, "that the element sodium is also a transmutation product of copper, because the residue, obtained by evaporating the copper solution, deprived of copper which had been treated with emanation is more than twice as heavy as that obtained from untreated copper sulphate." It was too early, however, he added, to propound any satisfactory theory "as to the relationship which undoubtedly exists between the properties of the atomic weights of the bodies which we have been accustomed to term elements."

New Turbine Station of the Fall River Electric Light Company.

A NEW steam turbine power plant has just been placed in service by the Fall River Electric Light Company. The station is one of the most modern in New England, and supersedes a reciprocating-engine plant, which has been in service for many years. The power house is located on the east bank of the Taunton River, at the foot of Hathaway Street, and projecting into the river is a masonry wharf 205 ft. long by 105 ft. wide so that coal may be delivered by boat.

The present new station equipment consists of the following principal apparatus: Four 350-hp Babcock & Wilcox boilers;

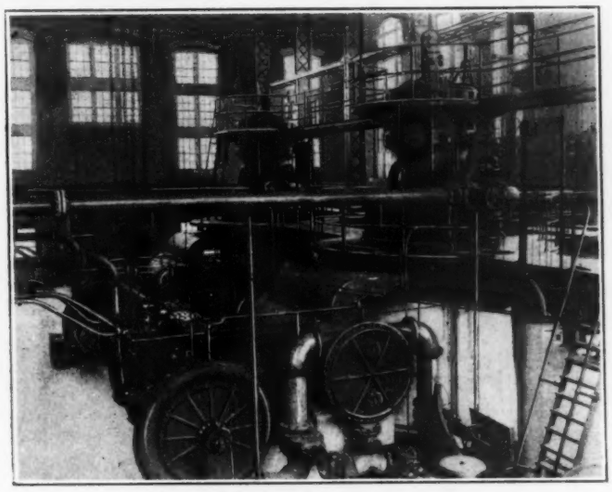


FIG. 1.—CONDENSER EQUIPMENT FOR 1000-KW. TURBINE.

one 500-kw Curtis turbine; two 1000-kw Curtis turbines; one Green fuel economizer; one brick stack, 10 ft. inside diameter, 145 ft. high; one induced draft fan, 11 ft. in diameter, 5 ft. wide; three sets of Wheeler condensing apparatus; one 2300-volt switchboard of General Electric design, one 2000-hp Wainwright feed-water heater; two Knowles duplex plunger feed-water pumps fitted with feed pump regulators; two Worthington duplex plunger oil pumps; two Turner oil filters with a filter rating of 12 gals. per minute; one emergency motor-driven oil pump; one 35-kw marine-type engine exciter set and one 35-kw motor-generator exciter set.

The station building is a steel frame structure, having walls of brick, with white terra cotta trimmings, and granite water table and base course. Two of the walls are left unfinished in anticipation of station enlargement. The general design of the station is shown in the accompanying engravings. As at present built, the station is divided into a firing aisle, with space for a future coal pocket overhead; a boiler room with basement, and a turbine room and switchboard gallery section, no basement being beneath the two latter divisions. Most of the auxiliary machinery is located in the turbine room, where it is constantly under the observation of the operating engineers. Ample space for each branch of the station service is provided in the building design. The firing aisles will ultimately be central with respect to the boilers, as it is planned to install a second row opposite the first when the growth of the plant demands it. The main steam header is provided with blank flanges for future boiler connections. Behind the boilers is laid a floor of rolled plates. A concrete floor is laid in front of the boilers, and a similar floor is provided for the feed-water heater, which is located on a platform in the turbine room.

The condensing water conduits, walls above them, intake and discharge outlets, sub-foundations of the turbines, and the exhaust pipe tunnel of the plant are all built of concrete. The building and chimney foundations are also of concrete, and are supported on piles. All weight-carrying footings within the building are also on piles. Condensing water is taken from the Taunton River. The concrete intake tunnel is about 140 ft. long, and the discharge conduit 291 ft. in length. The intake tunnel is provided with an 8-in.-thick hard pine gate 11 ft. wide and 7 ft. high provided with a 12 in. x 12 in. filler gate, the main gate having cast-iron wedges to force it against the concrete wall face when in closed position. The gate is operated by an S. Morgan Smith gate rigging; the filler gate stem is threaded and extends through upper cross bar and is operated by a hand wheel with collar, so that the gate may be forced down as well as lifted. The screen chamber is 10 ft. wide and 15 ft. 6 ins. high. A 1000-lb. triplex hoist is provided above the screen chamber to facilitate the removal of the screens for cleaning or repairs. After the intake and discharge tunnels enter the building, they are carried beneath the turbine room straight across the building, the inverts being 9.5 ft. below the level of the turbine room floor. Each tunnel is 6.5 ft. high and 7 ft. wide, the capacity being sufficient for the plant when extended beyond the present equipment.

The boilers are set in two batteries of two each. The row of boilers is located 12 ft. away from the 18-in. brick division wall separating the boiler and turbine rooms, leaving plenty of space for the smoke header and economizer. The chimney is located at the other end of the boiler room, but when the plant is extended, the chimney will be centrally located. The chimney is equipped with a baffle plate, which throws half its horizontal cross-section out of service for the present installation reserving it for future additions. The induced draft fan is located close to the chimney, but on the inside of the boiler room wall.

Each boiler contains 3467 sq. ft. of heating surface and a 7 ft. x 8 ft. 6 in. grate. Each boiler is fitted with white enamelled brick fronts and a Babcock & Wilcox superheater, guaranteed to heat the steam at a pressure of 160 lbs. to 470 deg. F. total temperature. The main delivery outlets of the boilers are 8 ins. in diameter. Beneath the grates are installed steel-plate, brick-lined ash hoppers arranged to discharge into hand cars which will be run out of the building when track and cars are later installed.

The smoke header is located directly behind the boilers, the cross-section being 7 ft. 6 ins x 7 ft., and the bottom 7 ft. 6 ins.

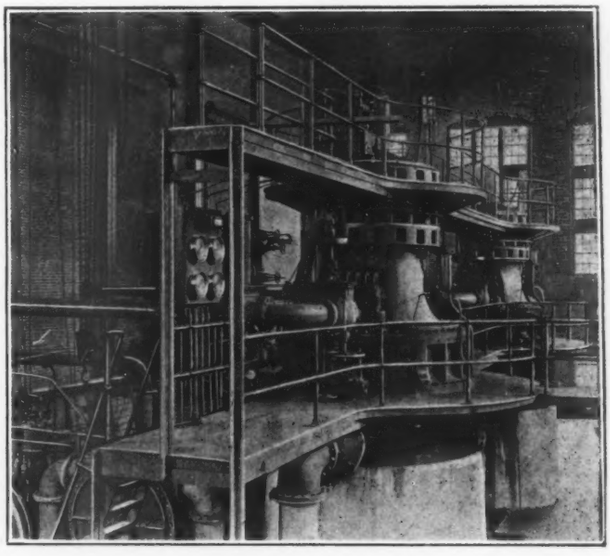


FIG. 2.—1000-KW TURBO-GENERATOR IN FALL RIVER STATION.

above the floor. Each boiler discharges directly into the smoke header by a flue 4 ft. long. The header connections are arranged so that the hot gases can be discharged through the economizer to the stack direct or by way of the induced draft fan to the stack direct from the boilers, or through the fan; by division dampers gases from one battery may go through the economizer and those from the other direct, as may be desired. A Locke damper regulator is installed in connection with the dampers at the end of the economizer, at the end of the direct

flue, and the regulating valve on the fan engine, provision being made for attachment of the regulator chain as desired. These dampers are also arranged to be operated by hand. The economizer contains 8976 sq. ft. of heating surface, the tubes being arranged in 68 sections. The induced draft fan has a special outlet 5 ft. x 7 ft. 4 in., and it is direct-driven by a horizontal center crank engine built for 160 lbs. steam pressure and 25 deg. superheat. The arrangement of the flues for the flexible operation desired presented an unusually difficult problem in iron work. Special ladders are provided to facilitate access to all parts of the flues and economizers. The tube scrapers are driven by two 3-hp back-geared General Electric motors through a Morse chain connecting the back-geared shaft to the economizer drive shaft. A special feature of the economizer installation is a series of soot hoppers, each is also provided beneath each boiler behind the bridge wall and opposite the clean-out door.

The steam piping system is flexible and direct. A 12-in. main header is carried through the boiler room basement. Each 8-in. steam line rises on an angle away from the boiler outlet, clears the boiler by a full sweep and is carried downward to the header. From the header each turbine is supplied by an 8-in. or a 6-in. line, depending on the size of the unit, which is carried by a riser into a horizontal lead running across the turbine room to the generating unit it serves. Each turbine may be supplied with steam from the battery of boilers directly opposite it by closing valves in the main header. A Holly loop system returns all high-pressnre drips to the boilers.

For the supply of auxiliaries, a 5-in. main in the boiler room basement parallels the turbine steam main. Four 4-in. cross-connections are provided between the two mains. The fan engine is supplied by a 3-in. connection, and the other auxiliary connections vary in general from 1½ ins. to 3 ins.

Each turbine drives a General Electric 2300-volt, three-phase, 60-cycle alternator, the speed of the 500-kw set being 1800 r. p. m., and of the 1000-kw units 1200 r. p. m. The larger

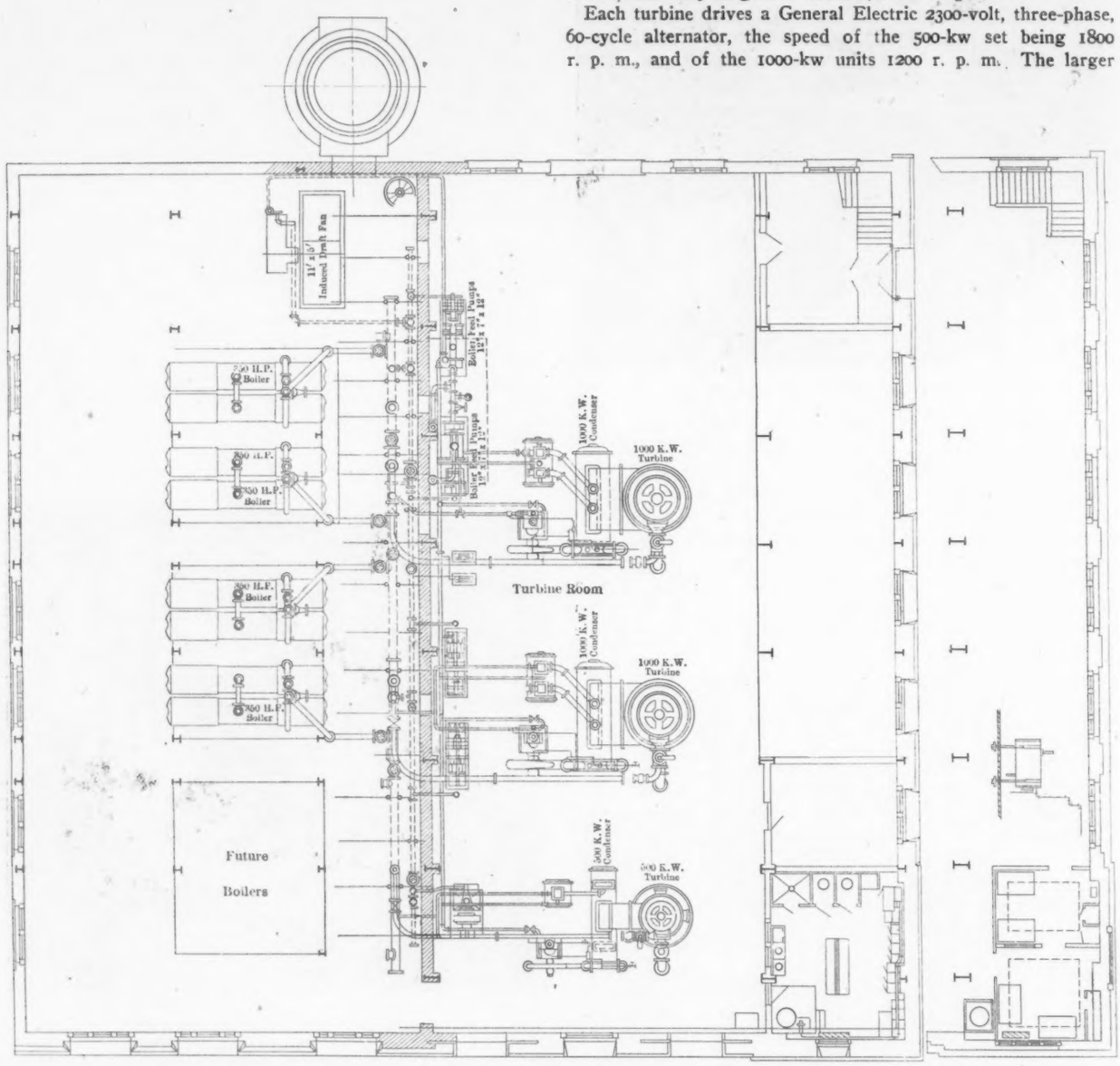


FIG. 3.—PLAN VIEW OF FALL RIVER ELECTRIC LIGHT COMPANY'S POWER HOUSE.

inclined on three sides and forming the bottom of the economizer clean-out chamber. The hopper slopes toward a bell-mouth, from which a discharge pipe is carried downward to a point about 3 ft. above the boiler-room floor, and is closed by a special slide valve. This arrangement greatly facilitates the removal of soot and dirt from the economizer chamber. A soot chute

machines have a full-load current of 251 amperes per phase, and the small unit, 126 amperes. Each turbine is capable of withstanding a 75 per cent momentary overload without injury. The maximum excitation of the 500-kw machine is 8 kilowatts at 125 volts; of each 1000-kw unit it is 12 kilowatts with 80 per cent power factor and 25 per cent overload. The guaranteed

steam consumption in pounds per kw-hour at 150 lbs. pressure and 25 deg. superheat, with not over 2 inches absolute back pressure, is as follows:

	500-kw unit.	100-kw unit.
½ load	22.	21.6
Full load	19.6	19.6
1½ load	20.1	20.1
Variable ½ to 1½ load	21.5	21.1

Two duplex steam-driven oil-pressure Worthington pumps are provided, each pump having capacity for four 1000-kw

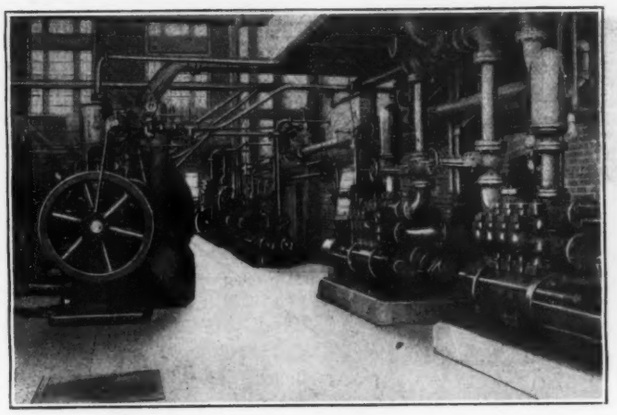


FIG. 4.—FEED WATER PUMPS IN TURBINE ROOM.

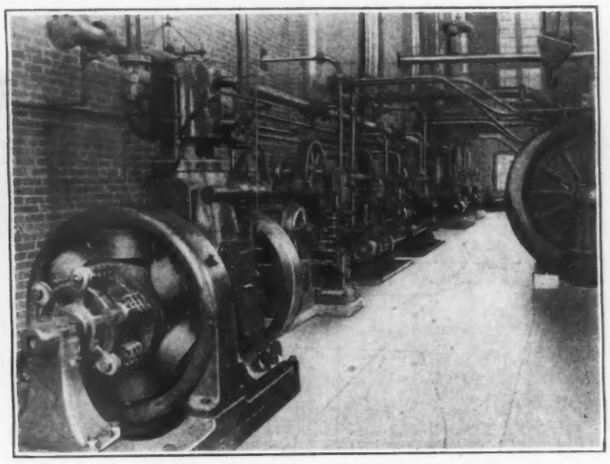


FIG. 6.—EXCITER UNIT AND OIL PUMPS.

turbines, using oil at a pressure of 500 to 600 lbs. No. accumulators were installed. To guard against any failure of the steam pumps, a motor-driven triplex pump is arranged to start automatically in case the oil pressure drops. The latter pump can also be started by hand and by remote control.

The free exhaust arrangements of the Fall River turbines are unusually simple and effective. Beneath the turbine foundations

Normally each turbine exhausts into a Wheeler counter-current surface condenser of the single-tube type. Cooling surfaces installed are 3600 sq. ft. for each 1000-kw unit and 1800 for the 500-kw unit. The condensed steam of the 500-kw unit is delivered to the hot well piping by an Edwards single air pump, and the condensation of the two larger units is handled by two duplex Edwards air pumps. Double suction pipes are carried from the condensers of the larger unit to the air pumps, and a single line from the 500-kw condenser. No wet or dry vacuum pumps are used, but the air pump discharges are carried into a 6-in. main in the boiler room basement from which connections are made into two hot well tanks, each 5 ft. 6 ins. in diameter and 20 ft. long. These are of wrought

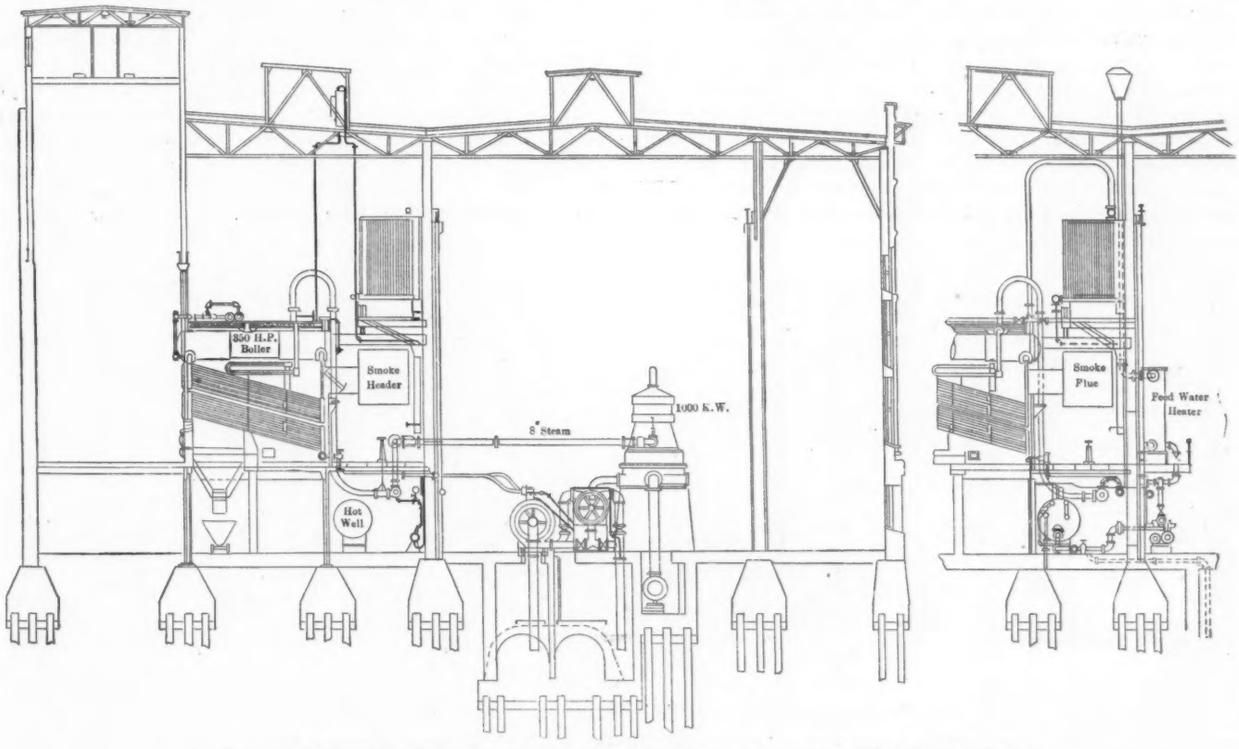


FIG. 5.—SECTIONAL ELEVATION OF FALL RIVER ELECTRIC LIGHT COMPANY'S POWER HOUSE.

is built a concrete trench which runs across the building, parallel with the boiler room division wall, and which carries a 30-in. pipe leading by two bends to an open end above the roof. The units are arranged to deliver into this trunk line through relief valves in the 16-in. and 12-in. pipes leading downward to the main.

iron, and are also located in the basement. Air relief pipes, 8 ins. and 6 ins. in diameter, are attached to the air pump discharge lines. From the hot well the condensation is carried to the feed-water heater and economizer, by-passes being provided for each. The feed pumps are two Knowles units, located in the turbine room, with duplex cylinders. Both hot wells deliver

feed-water into a 6-in. line which branches to the pumps before delivering to the heater and economizer. Thermometers are installed on the suction side of the feed pumps and on each side of the feed-water heater and economizer. The water flows on the feed pumps with a head of about 3 ft., and the discharge head is 48 ft. to the top of the economizer and across the boilers through a 5-in. loop with 2-in. branches to the boiler units. The boilers are also provided with a 4-in. cold water feed line which extends across the top of each battery, and connects with the city service. The temperature of the hot-well water varies with that of the condensed steam and make-up water.

Circulating water for the 500-kw condenser is drawn from the intake conduit by an 8-in. Wheeler double-suction centrifugal pump driven by a vertical direct-connected engine. The suction opening is 10 ins. and the discharge 8 ins. Each of the larger units is supplied with circulating water by a similar 12-in. engine-driven centrifugal pump. A special feature of the condenser piping is an arrangement of the supply and discharge lines so that the direction of water circulation in the tubes can be reversed. This cleans from the ends of the tables the refuse that is too small to be stopped by the intake screens. The condensing equipment is guaranteed to maintain a 28-in. vacuum with sea water circulation at not over 70 deg. F., when condensing 10,500 lbs. steam per hour from the 500-kw set and 21,000 lbs. per hour from each of the 1000-kw units.

From each turbine two platforms are run to the next unit, with stairways connecting the upper and lower galleries with each other, the lower gallery to the switchboard gallery and with the floor. The upper gallery is 19 ft. 10 ins. above the floor, and the lower gallery is 11 ft. 4 ins. above the floor. At the 500-kw unit the galleries are 18¼ ft. 9½ ft. above the floor, with stairways between the various levels.

The cables from the turbines are carried down to the floor in individual brass piping, and are then run across the plant in 2½-in. fibre conduit to the space below the switchboard gallery, whence they pass to the panel connections above. There is a pull pit between the end of the brass pipe and the beginning of the fibre conduit. Two 35-kw exciters are installed, one being engine-driven and the other motor-driven. The switchboard is carried on a long leaf hard pine timber 17 ft. long, 8 ins. wide, and 6 ins. deep, with beveled edges. This timber is set into the concrete of the gallery adjoining a 1¼-in. slate slab, through which the wire and switch-operating rods pass. Oil-switch framing is carried on similar timber strips and slate slabs are provided for the wire and rods to pass through.

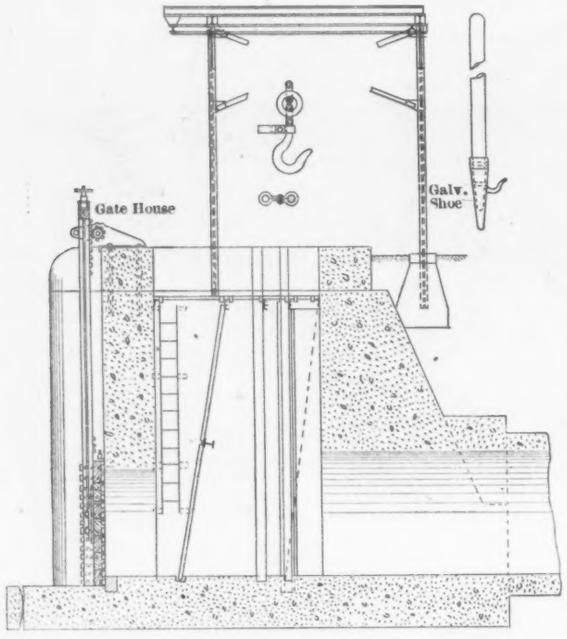


FIG. 7.—INTAKE GATE AND SCREEN CHAMBER FOR CIRCULATING WATER.

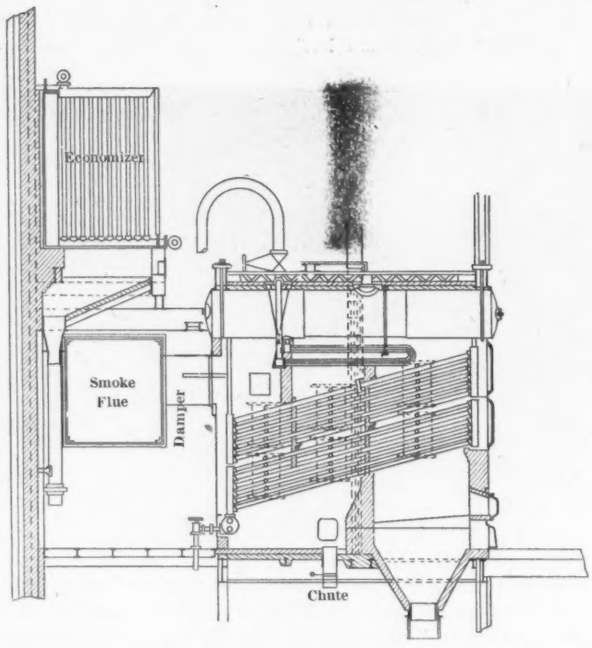


FIG. 9.—ARRANGEMENT OF SOOT CHUTES BELOW ECONOMIZER AND BOILER FURNACES.

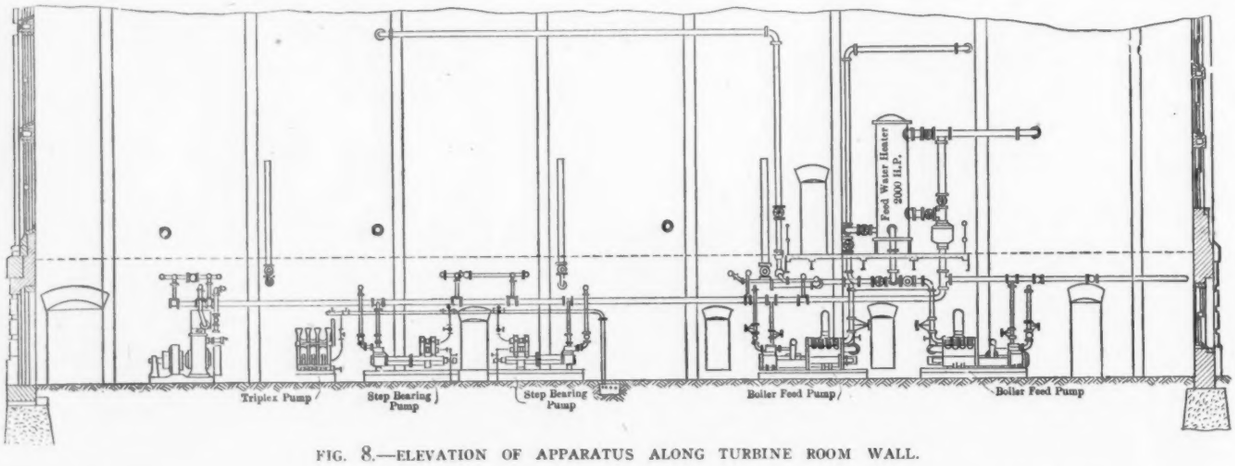


FIG. 8.—ELEVATION OF APPARATUS ALONG TURBINE ROOM WALL.

The switchboard is of black Monson slate and consists of two exciter panels, three three-phase generators panels, three blanks for future units, three three-phase outgoing line panels, three blanks, one induction motor and regulator panel, and one station feeder panel. Two sets of bus-bars are provided; connection to either set being made by one of two single-throw switches for each generator and feeder.

In connection with the plant changes, a new distributing sub-station has been built about a mile and a half from the station, near the center of the business district. This sub-station contains a 19-panel switchboard, and the following services are provided at present: Three three-phase, 500-kw incoming lines, three three-unit motor-generator sets, each consisting of a 2300-volt, 450-hp induction motor direct-connected to two 150-kw shunt-wound 120-140-volt generators for three-wire service, five combination lamp and motor feeder circuits, and 14 Edison three-wire circuits. Mr. Edward B. Richardson was engineer in charge of the designing work and Mr. G. G. Shedd was in charge of the construction work as resident engineer for the consulting engineers. The new station and sub-stations were designed by Messrs. Hollis French and Allen Hubbard, consulting engineers of Boston, who received very valuable assistance from the experienced superintendent of the Fall River Electric Light Company, Mr. Harry Bottomley.

Magnetic Leakage in Induction Motors.

By R. E. HELLMUND.

In the issue of the ELECTRICAL WORLD of Nov. 23, 1907, the writer gave a formula for the leakage coefficient of induction motors. It was mentioned there that the end-connection leakage depends largely upon the style, form and arrangement of the end-connections. It may be well to give a somewhat more detailed account of the various factors which influence the end-connection leakage to any practical extent.

In considering the end-connection leakage, that is, all the fluxes which find a path around the ends of the coils outside of the iron core, one must distinguish between three essentially different kinds of fluxes:

(a) Fluxes which form around each individual coil outside of the slots. In any type of winding the coil coming out of the slot runs over a certain distance separately from any other coil, before it can be bent so as to join with the other coils to form one common bunch. The fluxes formed around the separately running coils are the chief causes establishing the individual coil leakage.

(b) There are fluxes which form around that part of the end-connections at which all or some coils of one phase of each pole run closely together; these fluxes may be called the individual phase-leakage fluxes.

(c) There are fluxes which form around such parts of the end-connections at which several coils of two or more phases run closely together; these fluxes may be called the resultant-phase leakage fluxes.

In the following discussion, consideration will be given to only such factors as so affect these various leakage fluxes that a change of the leakage coefficient—that is, the ratio of the total stationary reactance to the synchronous no-load reactance—is thereby caused. Thus such factors will be considered as influence the leakage fluxes without causing a proportional change in the main flux of the motor.

For any of the above three leakages the following factors must be taken into consideration: (1) The length of the end-connection part around which they form; (2) the resultant current volume of the end-connection part around which they form; (3) the length of the magnetic path around the end-connection part under consideration; (4) the influence of the permeability of magnetic materials through which the fluxes may happen to pass; (5) the influence of reactive currents induced in metallic parts through which the fluxes may happen to pass.

Consider now each of these factors separately. It is obvious that each of the leakage fluxes is the larger the longer the part of the end-connection around which it forms.

The current volume of each particular coil is, of course, directly proportional to the number of turns of the coil, and to the current per turn. If a number of individual coils of the same phase run closely together the current volume increases proportional to the number of coils. If a number of coils of different phases run closely together, the phase relation of the currents in the coils must be taken into consideration also. If, for instance, the current volume of one coil equals v, the effective current volume of two coils of different phases in a two-phase motor is only $\sqrt{2}v$, while the current volume of two coils of the same phase would be equal to $2v$. In a three-phase motor: Current volume of two coils of the same phase $= 2v$; current volume of two coils of two different phases $= v$; current volume of three coils of the same phase $= 3v$; current volume of three coils of three different phases $= 2v$ or 0, depending upon the way the three coils are joined.

The length of the magnetic path around the coils depends upon their active cross-section and upon their form. Considering the influence of the form of the coil, it appears at once from a simple geometrical consideration that for a given section of a coil the path around the coil is the smallest if the coil has a circular section; it is larger for a square section and larger yet for a rectangular section having a long and a short side. Within practical limits the leakage will, therefore, as a rule, be the smaller the flatter the coil is wound, if the flat form may be obtained without increasing the length of the end-connections considerably.

It is obvious that the existence of magnetic material in the path of the leakage fluxes will tend to increase the leakage flux since it decreases the reluctance of a part of the magnetic path. This tendency will, of course, be larger the closer the magnetic material comes to the end-connections and the longer the path through the magnetic material is in comparison with the remaining path through the air.

At any place where the fluxes pass through electrically conductive parts, they will induce currents which counteract the m. m. f. of the end-connections and, therefore, tend to decrease the leakage fluxes. These currents and their reactive effects are, of course, larger the lower the resistance of the parts being passed and the closer the parts are to the end-connections.

In considering the total end-connection leakage, another very important factor must be taken into consideration besides those brought out above; this is the number of coils being used per pole per phase. If the total current volume V of one pole and one phase is carried by n coils, which are separately wound, each coil carries a current volume equal to

$$V \div n$$

If, moreover, the total section of the coils of one pole and one phase is assumed to be S, the section of one coil equals

$$S \div n$$

Moreover, it may be assumed that the coils have a rectangular shape, with one side equal to a and the other equal to ka; then

$$ka^2 = S \div n, \text{ or } a = \sqrt{\frac{S}{kn}}$$

The circumference of each coil is, therefore, proportional to:

$$\sqrt{\frac{S}{kn}}(1+k)$$

and the leakage coefficient is proportional to:

$$\frac{V}{n}\sqrt{\frac{nk}{S}}\frac{1}{1+k} \text{ or } \frac{V}{\sqrt{n}}\sqrt{\frac{k}{S}}\frac{1}{1+k}$$

that means the end-connection leakage coefficient is inversely proportional to the square root of the number of coils running separately. The above, of course, applies exactly only when the form of the coils does not change with the number of coils. In practice this does not always hold, but it may be shown that in almost all practical cases a subdivision of the coils will cause a reduction of the leakage if the subdivision can be accomplished without increasing the length of the end-connections considerably.

Keeping all of the above factors in mind, among others there are found the following constructional and electrical details, which have an influence upon the end-connection leakage, and which should be considered in calculating new designs or altering existing designs:

The style of winding, which influences every one of the above factors. In Figs. 1 to 5 five different styles of three-phase windings are shown. In the following the respective merits of these windings with regard to the various factors will be indicated by the succession in which their numbers are given.

With regard to the length of the end-connections they range as follows: 1, 2, 3, 4, 5, which means the end-connections are the shortest for winding 1 and the longest for winding 5.

The resultant current volume is largely influenced by the

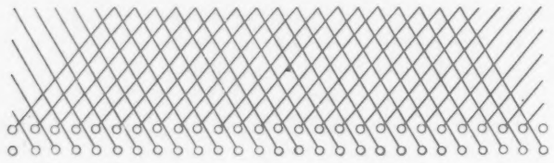


FIG. 1.—PROGRESSIVE WINDING WITH TWO COILS IN EACH SLOT.

style of winding. In three-phase motors with progressive windings, for instance, it happens that the resultant current volume for the longest part of the end-connections is zero, while in undivided concentric windings (Fig. 5) this advantageous action of the combination of the phases does not take place, since there are at no place more than two phases running together. In regard to the advantageous effect of the combination of the phases the five styles of winding range about as follows: 1, 2, 5, 3, 4.

Of course, the style of the winding largely influences the form of the coils and consequently the length of the magnetic

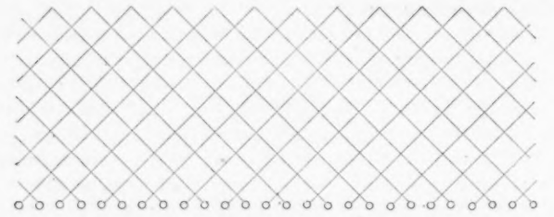


FIG. 2.—PROGRESSIVE WINDING WITH ONE COIL IN EACH SLOT.

path around them. It is, however, difficult to decide upon their respective merits, since for some of the windings the form of the coils may be largely varied. The following grouping, however, will be close to facts for most practical cases: 1, 5, 3, 2, 4.

The style of winding determines largely how close the end-connections come to metallic parts, magnetic or non-magnetic. The respective merits of the various windings cannot be determined, however, without knowing the mechanical construction of the motor.

It is evident that windings with two coils per slot require a larger number of coils than windings with one coil per slot.

FIG. 3.—DIVIDED CONCENTRIC WINDING WITH ONE COIL IN EACH SLOT.

Windings with two coils per slot are, therefore, advantageous. Also it is obvious that a divided concentric winding is better than a concentrated winding in this respect. The windings may be grouped as follows in regard to this factor: 1, 5, 2, 3, 4.

The number of slots per pole per phase has a noticeable influence on the following factors:

The form of the coil section of that part of the end-connections which consists of a number of coils depends largely upon the number of slots per pole per phase. In most practical cases it is flatter the larger the number of slots per pole per phase.

The number of coils per pole per phase is directly proportional to the number of slots per pole per phase.

It follows from the above that the number of slots per pole per phase has quite a considerable influence upon the end-connection leakage.

The size of the slots influences the following factors:

An increase of the slot necessitates an increase in the length of the end-connections.

An increase of the slot requires a larger circumference of the coils.

It is to be noted that the two effects counteract and, therefore, partly or entirely eliminate each other.

The form of the slots influences the following factors:

1. The width of the slots has a certain influence on the length

FIG. 4.—CONCENTRATED CONCENTRIC WINDING WITH ONE COIL IN EACH SLOT.

of the end-connections. As a rule, the end-connections are longer the wider the slots.

2. The form of the slots determines directly the form of the individual coil coming out of the slot and also to a certain extent that part of the end-connections which is formed by a number of coils.

It follows from the above that a deep and narrow slot is favorable for the end-connection leakage. This may partly or entirely eliminate the unfavorable influence which such a slot has upon the slot leakage.

The form of the bearing brackets and the end plates may, of course, influence most of the factors to a certain degree, since the arrangement of the end-connections in general must be so made as to fit into the bearing brackets. The following factors are especially important, however: The reduction of the reluctance of the leakage path caused by the iron of the bearing brackets and end-plates; the eddy currents produced in the bearing brackets and the end plates, which counteract the leakage flux. Since these factors counteract each other when the bearing brackets and end-plates are made of iron, their influence in one direction or the other may be hardly noticeable. In fact, the writer has repeatedly found that the removal of the bearing brackets had no measurable influence upon the leakage fluxes. In certain constructions, however, where the end-plates were entirely omitted and the end-connections came close to the laminated iron of the core, in which the eddy currents are limited, an increase of the leakage fluxes seemed to be effected thereby.

On the other hand, the use of brass bearing brackets and end-plates will possibly reduce the leakage somewhat, since in this case only the counteracting eddy currents come into consideration. From the fact that eddy currents reduce the leakage, it

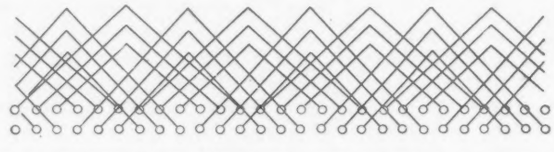


FIG. 5.—CONCENTRATED CONCENTRIC WITH TWO COILS IN EACH SLOT.

should not be concluded that their existence is desirable, since the advantage in regard to the leakage is secured only by additional losses in the motor.

Everything said about the influence of the bearing brackets and the end-plates upon the leakage of the stator applies in a similar way to end-plates, coil-supports and band-wires of the rotor.

The distance between the windings of the two members has an influence upon the leakage flux. The larger part of the end-

connection leakage fluxes must pass through the space between the primary and secondary end-connections, therefore, the fluxes will necessarily be smaller the shorter the distance between the two windings. In connection with this it should be kept in mind, however, that for mechanical reasons the distance should not be made too small.

The number of phases by which the motor is operated has an influence upon the end-connection leakage. It has been mentioned above that for certain three-phase windings the resultant phase m. m. f. is zero, while that of two-phase windings is always at least $\sqrt{2}v$. It follows, therefore. that the end-connection leakage of two-phase windings is larger than that of certain three-phase windings. The number of phases also influence the size and shape of the coil bunches per phase.

The potential of the motor influences the leakage in so far as the distance between the coils in high-potential windings must be kept large and consequently the end-connections must be long; on account of the thick insulation around the coil in the slot the active section of the coils will be smaller in high-potential motors than in low-potential motors with the same size of slots. For this reason a high-potential motor will tend to have a larger leakage than the same motor wound for low potential.

In looking over this large number of factors, constructional details, etc., it is at once obvious that it is almost impossible to calculate the end-connection leakage by a formula which is exact for all cases and fulfills, moreover, the most important condition of being simple enough for practical use.

The only factor that can be easily determined in practice is the average length of the end-connnections; therefore, this factor may be taken directly into consideration in a formula. For most of the other factors it is impossible, or at least difficult to introduce them exactly into a formula; it is especially evident that it will always be impossible to make correct assumption as to how much of the total length of the end-connections should be taken into consideration for the individual coil-leakage, how much for the individual phase-leakage and how much for the resultant phase-leakage. A further complication is introduced by the fact that the fluxes caused by the resultant phase m. m. f. differs in time-phase from the individual phase and coil leakages. It would also be difficult to determine the length of the magnetic paths around the various parts of the end-connections, and it is entirely impossible to calculate the influence of the metallic parts which come close to the end-connections.

It seems advisable, therefore, to take all the factors except the length of the end-connections into account by one single coefficient, which must be found from tests for each particular line of motors. The only variation in this coefficient which is of practical importance and which occurs in motors of the same general design features is caused by the variation in the number of the slots per pole per phase. Where it is desirable to take this variation into account, the most practical way seems to be to determine the coefficient c_1 for different numbers of slots per pole and record the result in a curve which may be used for future calculations. After such curve, which gives the coefficient c_1 in terms of the number of slots per pole per phase has been found by test, it is, as a rule, not difficult to find an approximate and simple equation for the curve. For concentrated concentric winding and a certain line of motors, the writer has found, for instance, that the following equation gives good results:

$$c_1 = \frac{5.25\sqrt{a}}{a+3}$$

where a is the number of slots per pole of a three-phase motor and c_1 is the coefficient in the formula given by the writer in the issue mentioned above.

At this place it may be well to make a few remarks in regard to the formula for the leakage coefficient. As is well known, not only the reluctance of the leakage fluxes, but also the reluctance of the main flux path enters as an important factor into any formula for the leakage coefficient; since, however, certain values determining the reluctance of the main flux path have to be calculated anyhow for determining the magnetizing current of the motor, the formula for the leakage coefficient will be the more convenient for the designer the more it is built up upon factors which he has determined for other purposes. In order to facilitate the use of the formula in this respect the following may be stated.

In estimating the reluctance of the air-gap a large degree of uncertainty is unavoidable, because there are no exact facts known in regard to the dispersion of the lines of force at the tooth edges. Consequently, there are about as many ways of taking the dispersion into account as there are designers. For the calculation of the factor ψ, as given by the writer, an approximate way of taking the dispersion has been chosen. (It may be more exact and for most designers more convenient, however, to introduce values found by their own methods.) This may be done easily by making the value

$$\psi = \frac{Q\lambda}{l\lambda} = \frac{Q}{l}$$

where λ = the pole pitch of the motor.

l = the total width of the iron cores, and

Q = the active area of the pole face as determined for the calculation of the magnetized current by whatever method is prefered. Frequently the ratio

$$\frac{l\lambda}{Q} = F_a$$

is determined and called the air-gap factor; in this case, it is of course best to set

$$\psi = \frac{\lambda}{F_a}$$

Another uncertainty in the calculation of the reluctance of the air-gap is introduced by the fact that the actual average value of the length of the air-gap is mostly different from the value which is specified on the drawings. It is, therefore, customary to assume in the calculation of the magnetizing current an average value which is different from the specified air-gap by a certain percentage, the amount of which depends upon the method of manufacturing. This same value for the average air-gap should be, of course, introduced into the formula for the leakage coefficient, in which Δ is the average length of the air-gap at one side of the rotor (not the total air-gap).

A New Universal Photometer.

BY CLAYTON H. SHARP AND PRESTON S. MILLAR.

IN the course of our work at the Electrical Testing Laboratories we have felt very keenly the need of a thoroughly reliable and practical portable photometer or illuminometer. For years practically the only instrument on the market which could make serious claims to be a universal photometer, being adapted to measurements both of luminous intensity and of illumination, was the Weber photometer. Using this instrument we have made many tests, and we have been able to render this instrument much more convenient for practical work by making certain changes and additions, but it still left much to be desired. We were led therefore to design the instrument which is here described, and which, embodying features which are demanded by a thorough consideration of the theoretical and practical requirements, has proven itself in actual practice to be a most acceptable apparatus.

In a recent paper before the Illuminating Engineering Society one of us has discussed the general subject of illumination photometers and has pointed out the features which must characterize the ideal photometer, as follows: Sensitive photometric device, reliable comparison light source, the best means for varying the intensity, portability, simplicity of operation, and reasonable cost. For the measurement of illumination, a further requirement is a proper test plate to receive the illumination which is to be measured. This test plate must have a diffusing surface so that its illumination varies with the cosine of the angle of incidence of the light and must be so placed that no portion of the instrument or of the observer

obstructs any rays which might fall upon it. These features have all been carefully considered in this photometer. As a sensitive photometric device a modified form of Lummer-Brodhun arrangement has been adopted. The comparison light source is a seasoned incandescent lamp; the means of varying the intensity is varying the distance between the incandescent lamp and the plate on which its light falls; portability is insured by constructing the body of the instrument of wood and keeping down the weight to about eight pounds, and also by minimizing the number of detachable parts; the conditions regarding the

FIG. 1.—GENERAL VIEW OF PHOTOMETER.

test plate are met by using a plate of special glass with the upper surface depolished and so placed that the light can fall on it freely from all directions.

A view of the instrument is shown in Fig. 1, and a plan and elevation, showing the interior arrangement, is given in Fig. 2. The body of the instrument is a hardwood box about two feet in length, having a hinged cover so that the entire interior is accessible. On the exterior of the box are found certain parts, the uses of which are more or less obvious. The movable part of this photometer is the comparison lamp, and not the photometric device. The lamp is mounted within a circular metal housing and is carried on a platform arranged to slide in a track lengthwise of the box. The movement is effected by means of an inelastic cord which passes around pulleys and comes to a drum which can be turned by a large external knob. This method of moving the comparison lamp is at once very simple and effective. The friction is even and slight, but still sufficient so that the photometer can be operated in any position. The variable distance method has the great advantage that its indications depend upon a known law, and that consequently a scale can be made from calculation and not as a result of various trials. Moreover, the applicability of the law of inverse squares to the photometer is less liable to question than any other law. The scale from which the indications of the photometer are read, consists of translucent celluloid and is set in a longitudinal opening in the side of the box. In order to

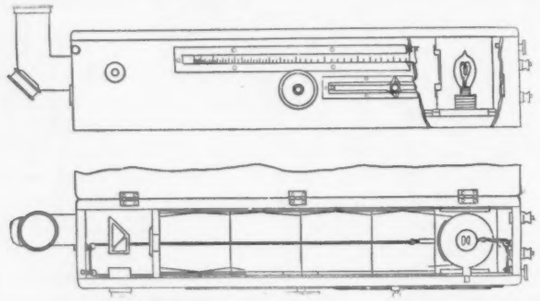


FIG. 2.—SIDE ELEVATION AND PLAN OF PHOTOMETER.

prevent external light from having access to the interior of the box, this scale is covered with a long shutter which can be opened by means of an external knob at the rear of the box. To facilitate taking readings in dark places, a hole is cut in the side of the housing carrying the comparison lamp, so that when the shutter over the scale is raised, the light from the lamp falls on the scale and illuminates it brightly, and the pointer, being inside the box, casts a shadow on the brightly lighted scale. This little detail is a very great convenience in the practical operation of the instrument. The light from the comparison lamp falls on a milk glass plate which fills a window in the partition near the end of the box.

A not uncommon source of error in photometry is due to stray light reflected by portions of the instrument or of its accessories. Surfaces, even though they are blackened as well as possible with a dull black paint, reflect considerable amounts of light when the angle of incidence is large. Evidently the amount of such reflection may vary with the position of the lamp and of the photometer box, thus causing the instrument to indicate falsely. This source of error is particularly liable to be encountered in small enclosed photometers, such as the one here described, and cannot be too carefully guarded against. Even a lining of black velvet is not entirely free from suspicion, and this method of construction is for structural reasons undesirable. In the photometer here described, this difficulty is met by the use of a very simple system of moving screens which are shown in Fig. 2. The screens are of fibre, of such size as practically to fill the box. They have apertures sufficiently large to permit the rays of the lamp to pass unobstructedly, and are supported by two longitudinal brass rods, being attached to each other and to the lamp carriage by light cords. When the comparison lamp advances, its housing pushes the screens successively along ahead of it; and when it recedes, the cords pull the screens one after the other into their original position. The screening system, while affording perfect protection, is so light and simple that it adds insignificantly to the weight or to the complication of the apparatus as a whole.

The photometric device is a modified form of Lummer-Brodhun arrangement. By the addition of another totally reflecting surface, rays from opposite directions are brought to

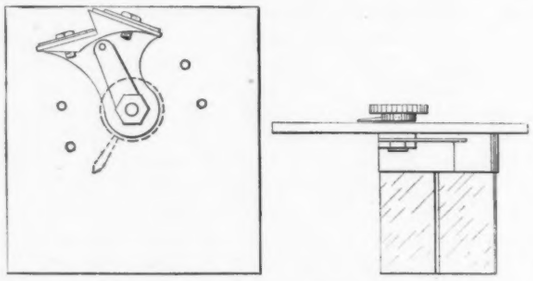


FIG. 3.—DIAGRAM OF SCREEN SYSTEM.

the sight tube. The field has the same form and the photometric device the same high sensibility as the Lummer-Brodhun photometer.

The elbow tube at the end of the box has a number of important functions to perform. It fits friction-tight on a collar fastened in the end of the box, and hence may be turned about a horizontal axis and set at any angle, which angle is indicated on a semi-circular scale on the end of the box. The use of a tube of this description furnishes the simplest means of measuring illumination or light coming from any direction. In the elbow of the tube is fixed a reversible plate, one side being a diffusely reflecting surface used in the measurements of candle-power, and the other a mirror used in connection with a test plate on the end of the tube for measuring illumination. In measuring candle-power, the diffusely reflecting surface is turned toward the inside of the tube, and the end of the elbow tube is open, the tube serving to screen off stray light from the plate. The distance between the plate and the source of light must be known.

The photometer being portable and the elbow tube adjustable to any angle, this arrangement lends itself to determinations of the vertical distribution of luminous intensity of light sources, and is also applicable to the measurement of the candle-power of street lamps, either close at hand or at a considerable distance from the lamps, as has been recommended in the report of the Committee on Street Lamp Specifications to the National Electric Light Association, at its last convention. Evidently the measurement of gas flames and incandescent

mantle burners lies also within the scope of the instrument. To measure general illumination, the translucent illumination test plate is slipped onto the end of the tube and the plate at the elbow is reversed, making its mirrored side effective. The illumination on any required plane can then be measured, the light having unobstructed access to the test plate. It has been found that the test plate of translucent glass, ground on its upper surface so that its power of regular reflection is destroyed, is well adapted to the purpose. Its selective absorption,

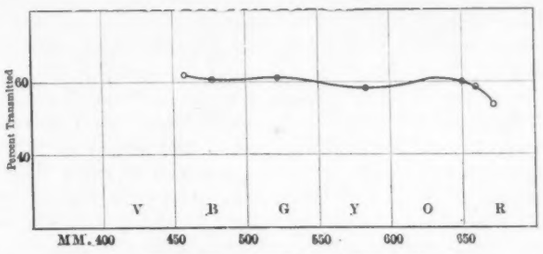


FIG. 4.—CURVE OF SPECTRO-PHOTOMETRIC TEST.

as shown by the results of a spectrophotometric test given in Fig. 4, is for all practical purposes nil, so that no prejudice is done to any source of light by reason of its color. The criterion for the complete diffusion effect of the plate is that its brightness shall vary directly as the cosine of the angle of incidence of the light upon it. The deviation from this law is shown by the curve of Fig. 5. The error so introduced in the measurement of diffuse illumination is ordinarily negligible.

The scale may be an equal-part scale, or a direct-reading scale. It has been found to be most convenient to make the scale direct-reading in foot-candles. The same scale is equally applicable to the measurement of illumination and of candle-power. The foot-candle scale in question has a range from 0.4 to 20 foot-candles. This range can of course be increased considerably by changing the candle-power of the comparison lamp, either by altering its voltage or by using a lamp of different size; but the range given with any one lamp cannot be considered sufficient to meet all the conditions which are present in practical work. It is not, in general, advisable to change the voltage of the comparison lamp, because, first, any alteration of this kind requires the use of an electrical measuring instrument of considerable range, and requires that its error be known over that entire range instead of at a single point; second, increasing the voltage of a lamp above its normal value may cause its candle-power to change too rapidly, while lower-

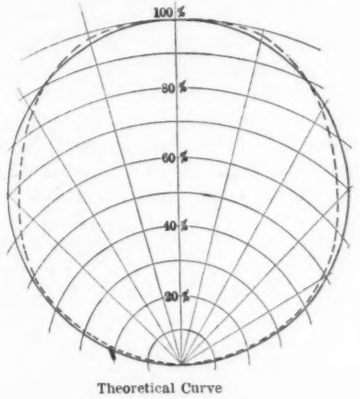


FIG. 5.—CURVE SHOWING ERROR OF TEST PLATE.

ing its voltage changes its color to an undesirable reddish hue. The change from one comparison lamp to another is an inconvenient operation. Recourse has been had, therefore, to the use of abserbing screens. Two of such screens are used, one of which transmits substantially 10 per cent of the light falling upon it, while the other transmits only one per cent of the light. These two screens are attached to a movable holder, which is not indicated in Fig. 2, but is shown in detail in Fig. 3. By turning the knurled head, which is exposed when the cover of the photometer box is lifted, either screen may be interposed between the prism and the milk glass window, or between the prism and the elbow tube, or both screens may be turned to such a position that they intercept no light. Evidently when the screens are used, the total range of measurement, with but one comparison lamp, is from 0.004 foot-candle to 2000 foot-candles, within which range all measureable lights and illuminations can be said to fall. It is to be understood, of course, that the coefficient of absorption of these screens must be determined exactly by measurement.

In the design of this instrument no endeavor has been made to meet the condition which obtains in most photometers, namely, that the light from the comparison lamp and from the lamp or illumination to be measured shall transverse similar and symmetrical paths, and that any absorption which is suffered by one light must be suffered by the other also. It is considered that this condition is of no importance whatever as long as the photometer is calibrated and used after the substitution method, which is undoubtedly the correct method for all photometric comparisons. The proper method of calibrating the instrument for the measurement of candle-power or illumination is by employing a known candle-power or illumination produced

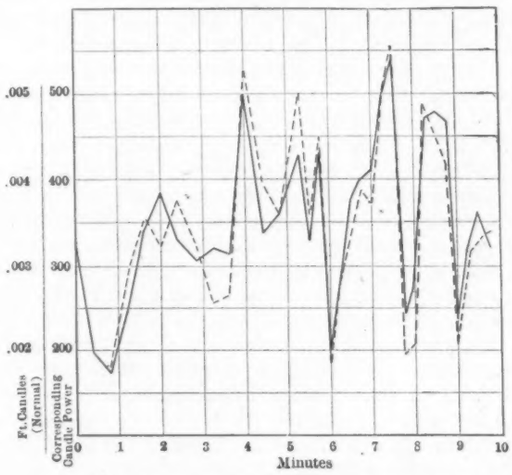


FIG. 6.—CANDLE-POWER CURVES OF ARC LAMP.

by a standard lamp. The voltage or current of the comparison lamp is adjusted by means of the slider rheostat on the box to such a value that the pointer on the scale indicates the known candle-power or illumination. The instrument then becomes direct reading for candle-power or illumination as the case may be, all effect of lack of symmetry, etc., being eliminated.

As has been said, the performance of the photometer in practice has been found to be very satisfactory. It has been used in widely different classes of work, as for instance, measurement of candle-power of incandescent lamps, laboratory measurements of arc and mercury-vapor lamps, street measurements of the candle-power of arc lamps and of incandescent gas lamps, measurements of illumination in rooms illuminated by incandescent lamps, arc lamps, Moore tube, etc. The choice of photometric device has been found to be an unusually good one, since its sensibility is so high as to enable very quick settings to be made, and it also enables extremely feeble illuminations or candle-power to be measured, such as are met with, for instance, in photometering an arc lamp at a distance of 250 feet. Moreover, the method of varying the distance of the comparison lamps is very convenient and quick, and the scale being illuminated from the inside can be read very quickly, so that a rapidly fluctuating source of light, such as the arc lamp, can be followed, and the amount of fluctuation can be determined. The capabilities of the instrument in this regard are illustrated in Fig. 6, which shows instantaneous values of the candle-power of an arc lamp, as given by simultaneous readings on two of these photometers. When one considers that the changes in the light are very rapid, it will be

seen that the agreement between the curves is sufficiently good to indicate that no fictitious quantity was being measured, but that both instruments were measuring as well as could be expected the instantaneous values. As a further test of the accuracy of the instrument, one of them was used to measure the candle-power of incandescent lamps which were at the same time being tested on a standard photometer bar. Taking the indications of the standard photometer as giving the true candle-power of the lamps, the error of the portable photometer was found to be well within the limits allowed in good industrial photometric practice.

When measuring illumination in rooms lighted by incandescent lamps, it is advisable to operate the comparison lamp in the photometer box from the same circuit as supplies the lighting of the room. Thus the effect of variations in voltage is minimized. It has been found that the photometer used in this way yields very satisfactory results, and that readings made at the different stations in a room which is being investigated repeat themselves on re-test, with all required closeness.

Growth of Electric Service at Memphis.

The Consolidated Gas and Electric Company, of Memphis, Tenn., supplies light and power to a population of about 175,000 people, occupying a territory of 20 sq. miles. Memphis is one of the most rapidly developing cities in the South; it is a commercial center and distributing point of a large agricultural area, and occupies a commanding position on the Mississippi River. In the character of its street railway service it compares favorably with any city of its size in the country that the writer has visited. Although the city is not pre-eminently a manufacturing town, a large power load has been developed by the Consolidated company during the past two or three years, until at the present time the total connected motor horsepower on the company's circuits is about 4500. Of this, 600 horse-power has been acquired since the end of June, 1907.

A single generating plant supplies all the company's customers. The power station is located at Beale and Myrtle Streets, about 1.5 miles from the business center of the city. All the machinery now in the plant is of the direct-connected, engine-driven type, with the exception of a 1500-kw Allis-Chalmers turbo-alternator, which is probably the entering wedge of evolutionary changes in the station development. Pea, nut and slack coal are burned, costing about $1.35 per ton. The calorific value of this coal averages about 11,750 b. t. u. per pound. The coal is mainly secured in western Kentucky, and is delivered to the plant on a spur track of the Southern Railway.

The boiler plant consists of four Aultman & Taylor 400-hp units and six Babcock & Wilcox units of 650 horse-power each, all the furnaces being equipped with the Jones underfeed stoker. Three steel stocks handle the products of combustion in conjunction with the fan equipment of the stoker system. The water supply at the station is drawn from six driven wells 450 ft. deep. There is one 12-in. well, one 8-in. well, two 10-in. and two 6-in. wells, all operated by an air lift supplied by two compressors of 2000 and 1100 cu. ft. per minute capacity each, at from 60 to 65 lbs. pressure. During the peak load both compressors are operated. To assist in maintaining the necessary supply of condensing water during the peak a concrete reservoir has been built outside the station walls and fronting on the street at the office end of the building. This reservoir is open to the air, is about 40 ft. deep and 80 ft. long, with a capacity of 450,000 gals.

In brief, the machinery equipment of the station consists of two 1750-kw Stanley three-phase, 2300-volt, revolving field alternators driven by horizontal cross-compound condensing engines; one 1500-kw Allis-Chalmers turbine, 2300 volts, three-phase, 1800 revolutions per minute; one 1050-kw General Electric 2300-volt generator driven by a McIntosh & Seymour cross-compound engine, and a similar 675-kw unit, with a tandem-compound engine. The Stanley machines are driven by Allis and Green-Wheelock engines. Jet condensers are used on all the engines. Two 75-kw exciter sets are provided, one motor and the other steam driven. Two sets of bus-bars are provided at the station switchboard, for flexible operation. A certain amount of 500-volt service is still necessary in the business district, and to meet this requirement three induction motor generator sets are installed at the plant. These have capacities of 500, 300 and 200 kilowatts, and are used for supplying electric elevators and other machinery requiring variable speed motors. A valuable adjunct of the station is a motor-driven machine shop beneath the switchboard gallery. The tools are group driven, and lamp repairs are to some extent carried on here.

The service from the station consists of single-phase, 2300-volt lighting; constant current arc lighting, street and commercial, 7.5 amperes; direct-current, 500 volts; three-phase power, 2300 volts; and three-phase power, 6600 volts. The last service is obtained by three 75-kw, oil-cooled, step-up transformers at the station which supply an 8-mile line of No. 4 three-phase copper leading to New South Memphis; at the latter point are a large number of manufacturing plants, some of which are entirely motor-operated. All the company's distribution service in the business district is carried underground, the area being about 6000 ft. long by 1500 ft. wide. Vitrified tile ducts are used, some of the conduits having 27 ducts. At the present time an effort is being made in Memphis to reduce the number of poles in the city, and the various public service corporations are combining in the use of poles, the cost being proportioned according to special agreement; each company erects and maintains its own cross arms and lines. The 6600-volt service to New South Memphis is carried on a private pole line owned by the Consolidated company.

The company carries a stock of Westinghouse motors on hand all the time ranging from ½ to 50 horse-power. Prospective power customers' conditions are carefully investigated, and if it appears that electricity will make a better showing than the old methods of driving, a motor is installed by the company on 30 days' trial. The company pays for the wiring and the consumer for the power. At the end of the month, if the motor installation is satisfactory, the consumer buys it practically at cost to the central station, which gives the customer the rate on the motor that is practically f. o. b. factory. So far the company has not had to remove a single motor thus placed on trial.

In the last two years the station load factor, as defined by the ratio of average 24-hour output to the peak, has been increased about 8 per cent. This has been accomplished by a careful and constant watching of power conditions, the improvement of irregular and fluctuating demands when possible, and the addition of steady loads to the system.

The rates of the company are open to the public and are as follows:

MONTHLY GUARANTEE BASIS.

Power.	Light.	Rate per kw-hour.
$10	$40	9.5 cts.
12.50	50	9. "
15	60	8.5 "
17.50	70	8. "
20	85	7.5 "
25	100	7. "
30	115	6.5 "
35	130	6. "
40	150	5.5 "
50	175	5. "
60	225	4.5 "
75	300	4. "
100	...	3.5 "
125	...	3. "
166⅔	...	3. 2. "

A guarantee of $2,000 per year for power fixes a rate of 3 cts. per unit for the first 5000 kw-hours used monthly, the balance being at 2 cts. each. There are no fixed charges and the base rate is 10 cts. An alternative power rate is 9.5 cts. on from 100 to 200 kw-hours per month, with 5 per cent discount, decreasing gradually to a rate of 3 cts. with 70 per cent discount on 9000 kw-hours or over per month. Up to 9 horsepower a monthly minimum of $2.50 is charged and $5 above 9 horse-power. The standard power service is 220 volts, three-phase.

A typical power installation at Memphis, which is a great woodworking center, is the plant of the Memphis Car Company. The capacity of this plant is 65 cars per week. All the machinery is direct connected, and driven by induction motors. The factory is located at New South Memphis, and its load factor, expressed in the ratio of maximum to connected load, is about 25 per cent. Oak and yellow pine are the materials mainly used, and the tools are designed for heavy cuts. There

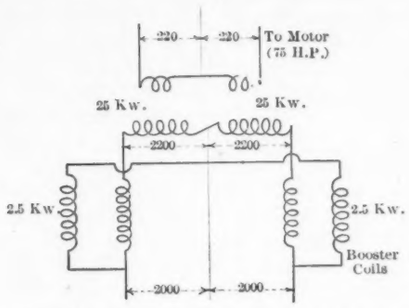


FIG. 1.—DIAGRAM OF TRANSFORMER CONNECTIONS.

is not a foot of line shafting in the entire plant. The following are the principal motors and tools:

Motor hp.	Tool.
30	36-in. rip saw
15	30-in. cross-cut saw
15	Horizontal mortiser
15	30-in. planer
15	Air compressor, 175 cu. ft. per minute
10	Gaining machine
7.5	8 spindle horizontal boring machines
5	40-in. band saw
3	Radial drill
3	Boring machine
0.5	Saw grinder
0.25 to 0.5	Duntley drills

This is a new plant and the transformer equipment consists of three 25-kw units.

Another new plant in the same territory is the Conley Switch and Frog Company. This house has 65 horse-power in motors, group drive, and a load factor of 40 per cent. The machinery is entirely for metal working and it includes the largest planer in the South and the first successful air trip-hammer in that part of the country.

The American Bag Company, of New South Memphis, is operated by 15 motors ranging from 3 to 50 horse-power. These are 440-volt machines, and to supply them with current at the proper voltage six 15-kw transformers are used, all secondaries being in series and two primaries being in multiple on each phase. The total connected load of this plant is about 200 horse-power, and the load factor is about 40 per cent. The company makes cloth bags, including three-color printing, and all the drives are individual. The machine list is, principally:

Motor hp.	Machine.
2—50	2—72-in. cloth drying mangles
1—30	Starching machines
1—15	5 printing presses (two run at once usually)
1—15	Cloth handling conveyor and rollers in bleachery
1—10	Tools in engraving shop
1— 7.5	2 cutting machines
1— 5	1 baling press
1— 5	Machine shop, small tools
4— 3	48 sewing machines, each 1800 stitches per minute

A 75-hp motor installation in a cotton seed oil plant has shown marked economy over steam. In this establishment a single motor drives a No. 19 attrition mill having a maximum 10-hour capacity of 1400 sacks of meal weighing 100 lbs. each. The plant runs from October until March, about 12 hours per day at 100 per cent load factor. As this load comes on the winter peak of the Consolidated company a contract has been arranged with the owner not to use electrical energy daily between 4:30 and 9:30 p. m. During the idle months of the year the motor does not depreciate as idle steam machinery does. This installation is at the end of a long feeder circuit, and is served by two 25-kw transformers connected in open delta. The motor voltage is 220, and the line voltage at this point is raised from 2000 to 2200 by the use of two 2.5-kw booster coils connected as shown in Fig. 1. Only the inside phases of the line are approximately balanced in this case.

About 12 refrigerating plants aggregating 800-hp connected load are in service on the mains of the company, and this class of customers has been found very desirable under the conditions obtaining in Tennessee. The peak load comes in the summer, and while the winter consumption is small, each plant operates part of each day. The largest individual installation is in the plant of Armour & Company. A 50-hp motor here drives a compressor, a 300-hp unit runs a smaller cooling machine, and a 10-hp motor drives a circulating pump. In addition there is an elevator load. The maximum cooling capacity of the plant is 50 tons refrigeration in 24 hours, and the energy consumption in summer is about 10 times that in the winter season, per month. Among the other prominent power installations are 500 horse-power in electric elevators, and several grain elevator plants exceeding 100 horse-power each.

One of the most interesting applications of power on the system, and one which suggests a field worth cultivating by other central stations, is in the use of a mercury arc rectifier to charge the storage batteries of the Memphis Telephone Company's central exchange. The scheme was worked out by Mr. Otis Myers, superintendent of the Telephone Company, and Mr. Carl K. Chapin, electrical engineer of the Consolidated Gas and Electric Company. A sketch of the principal connections is given herewith. The amount of power consumed in charging the telephone company's batteries has been about cut in two by the greater economy of the rectifier over the 500-volt motor-generator set formerly used. The apparatus has been in operation about 10 months.

The Memphis telephone plant is equipped with two sets of 640-ampere-hour chloride accumulators and a duplicate set of charging apparatus, each set including a 500-volt, 12-hp motor direct connected to a generator of the same size with a range suitable for charging a 40-volt battery. A motor-generator set of the size suitable for telephone work operating under the most favorable conditions has an efficiency of only about 65 per cent In addition to this low efficiency, when using two sets of batteries alternately, there is a loss of about 20 per cent in the batteries in charging and discharging, giving a full load net efficiency of only 52 per cent; and in plants using one set of batteries and a motor-generator, the net full load efficiency is between 52 and 65 per cent, depending upon the time the generator is carrying the load. These points show that the charging apparatus originally installed was of ample size, being designed to take care of the batteries fully equipped for 1200 ampere-hours; but when using it with the present equipment

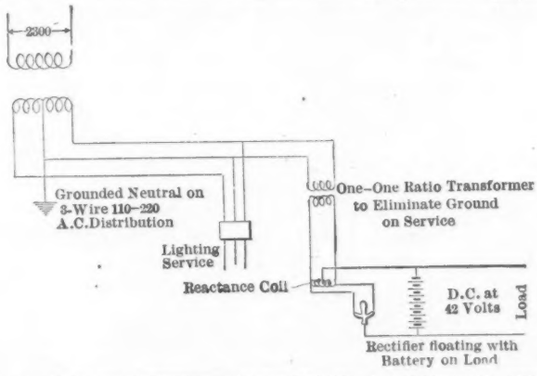


FIG. 2.—USE OF MERCURY ARC RECTIFIER IN CHARGING STORAGE BATTERY OF MEMPHIS TELEPHONE COMPANY.

of 640 ampere-hours capacity, it is necessary to keep running at the normal charging rate, regardless of the normal capacity of the machine. When running at the normal charging rate the motor-generator carries only about half load; consequently the efficiency does not exceed 45 per cent. under the most favorable conditions. On the other hand, the efficiency of the mercury rectifier is from 50 to 85 per cent, and the latter is low in first cost, compared with motor-generator equipment.

A rectifier panel was installed, the scheme being to float the

batteries and rectifiers together on the discharge bus-bars, as shown in the diagram. The average discharge rate for 24 hours is about 20 amperes, and when the panel was set up it was connected to get a direct current range of 30 to 46 volts, and the controller adjusted to supply 20 amperes, the idea being to give the tube some attention during the day to make it carry the load with the battery floating as an auxiliary. It was found, however, that the inherent regulation of the tube compensated for the varying discharge, due to the counter e. m. f. of the batteries, and without further regulation the tube carried about 90 per cent of the load, running up during the peak of the discharge, and dropping down to where the arc would barely hold when the discharge was at a minimum.

The tube was left cut in for one week when it was time to give the batteries an overcharge and inspection. The other set of batteries was thrown in on the discharge and the tube started, floating the batteries as at first. This course has been followed for about 10 months, leaving a set of batteries and the rectifier on for a week, and then overcharging and leaving the battery on open circuit while the other set is floated with the rectifier. It would naturally be supposed that without some arrangement to choke down the direct-current impulses they would tend to make the exchange noisy, but the impulses are so smoothed by the counter impulses from the reactance coil that the exchange is much quieter than when the batteries were charged from the motor-generator. It was found that at the end of a week's discharge in the above way, it took but 2.5 hours to overcharge the battery and bring it to the maximum, with the charging outfit at the normal charging rate, and the statement that the rectifier compensates to carry 90 per cent of the discharge is based on actual observations.

This installation has been so successful that the company finds it has about six times as much battery capacity as it needs, and it is planned to dispose of the present batteries and install one 240-ampere-hour battery in their place. The charging rate of the new battery will be 30 amperes, and the cells can be kept on the discharge with the rectifier continually; and the weekly overcharge can be obtained by running the controller up above the regular operating position. One of the motor-generator sets will be held as a reserve in case a tube burns out. The only part subject to depreciation in the rectifier set is the tube, which has an estimated life of 1000 hours at full load and a much longer life on light load. The telephone company operates one 30-ampere tube at half load for over 5000 hours; but even on an average life of 1000 hours the tube depreciation amounts to but 1 cent per hour. The present power consumption per month is about 1000 kw-hours alternating-current input to the rectifier, including the loss in the one to one transformer used to eliminate the ground on the secondary network of the central station. The present efficiency of the apparatus from the alternating-current input at the building to the direct-current side of the rectifier is about 70 per cent. This saving, together with the nearly automatic regulation, should appeal to every operating man as a battery plant which has to be looked after every day is generally either overcharged, or not charged enough, and the battery suffers; whereas, by giving one weekly overcharge and inspection it is possible to keep them in prime condition.

New Telephone Patents.

PARTY-LINE SYSTEMS.

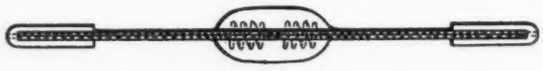
A most simple arrangement of a party line lockout system is described in a patent granted to N. S. Page, of New York City. This system is adapted to common battery lines. At each station is a very high-wound relay, whose circuit is associated with the hook switch and whose contacts control the connection of the bell with the line. These relays are so designed that when a set of talking instruments is across the line, all relays are shunted. The relay has a latch feature which prevents the rising of the hook switch when the relay is not operated. If a calling current be sent out upon the line, all relays operate, and connect in their bells. If the bell system be selective, the desired station only is rung. After the receiver is removed from the hook no other station can respond. It will be understood, of course, that the hook switch is not held completely blocked, but is permitted sufficient motion to close the relay circuit even though latched.

A selecting device for a step-by-step party line system forms the subject of a patent granted to O. F. Forsberg and assigned by him to the Western Electric Company.

A polarized magnet at each station serves to oscillate a lever arm at will to the right or left. Motion to the left advances a ratchet, while motion to the right is of no effect except at certain stated positions of the ratchet. One of these positions is at the limit of motion, while the other is adjustable and corresponds to the position of a movable stud. When a call is sent out, a number of "left-handed" impulses are transmitted corresponding with the station number. At this point the adjustable stud of the desired station rides under a lever and so raises it that an opposite impulse drives the oscillating lever against a switch bar and thereby connects this station to the line. The "left-hand" impulses are then continued until all stations have the extreme rotation, at which point the release lever has been raised to respond to an opposite impulse to be applied after conversation is completed. We now have the desired station connected for conversation and all switches set for release. When the final reverse impulse is sent, all switches return to normal simultaneously.

FUSIBLE PROTECTOR.

For a long time one of the recognized elements of complete protection for telephone circuits has been a sneak-current protector, to respond to such low currents as would only produce damage after a considerable time. The sneak-current device has almost universally been some sort of a resistance wire or medium in which sufficient heat will be generated to melt a fusible solder, thereby permitting the connections to break or short circuit. Following out this same plan, Joseph Sachs, of



SACHS' SAFETY FUSE.

Hartford, Conn., has produced a protector which will fit the ordinary fuse mountings. This is shown in section herewith. Between two slabs of insulating material in which cups have been formed the wires are run from the clamping terminals at the ends to the space within the abutted cups. Here the two wires are formed up into spirals and their ends soldered together with low fusing metal. With the generation of heat the solder melts and the points separate. If it is desired this whole device may be enclosed within a tube of the appearance of the usual enclosed fuse, in which case, of course, the terminals are transferred to the fuse cartridge.

Letters to the Editors.

Peregrinus and Paracelsus.

To the Editors of Electrical World:

Sirs:—There is a passage in the "History of the French Revolution," by Justin H. McCarthy, which richly deserves a place among the curiosities of literature. It reads: "In the long record of rascaldom from *Peregrinus* to Bamfylde Moore Carew, no single rascal stands forward with such magnificent effrontery, such majestic impudence, such astonishing success as Cagliostro." Vol. I, p. 256.

To put it mildly, this is a very serious *lapsus calami* in which a thirteenth century pioneer of science of the first rank and patriot of an exalted type is mistaken for a charlatan of the deepest dye. The individual meant by Mr. McCarthy to serve as prototype of the Sicilian impostor of the eighteenth century

was probably Paracelsus, the bombastic quack of the sixteenth.

If these lines reach Mr. McCarthy's notice and his "History" another edition, doubtless he will correct this regrettable error into which he has unwittingly fallen.

MANHATTAN COLLEGE, NEW YORK. BROTHER POTAMIAN.

Parallel Operation of Alternators.

To the Editors of Electrical World:

SIRS:—It is quite impossible for me to agree with you in your editorial comment on my article on the parallel operation of alternators, and I wish to offer evidence to support my argument concerning the inability of an alternator to take its share of the load when it loses its field excitation.

In the first place, I did not arrive at this conclusion by assuming that the synchronous impedances of the two machines were equal or constant, but, merely from the nature of the resultant field excitation in that alternator whose field is open. As for the actual result of opening the field of one machine, I wish to give the following experimental data, which were taken

Field Current		E. m. f. Volts at load	Current per lead, amp.		Power Factor		Output, k.w.	
No. 1	No. 2		No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
3.71	3.71	165	9.2	8.8	1.00	1.00	4.6	4.1
3.73	2.00	132	12.0	12.1	0.63	0.60	3.0	2.9
3.73	0.97	111	17.3+	16.9+	0.38+	0.35+	2.2	1.85
3.73	0.00	83	24. −	23. −	0.44−	0.02−	2.6	−0.10

on two General Electric three-phase, 230-volt, 15-kw alternators with rotating fields. The generators were driven by 30-hp motors which had additional resistance inserted in their armature circuits to give them a sufficiently drooping load-speed characteristic. Generator No. 1 was operated at constant field current, while the field current of No. 2 was varied. Observations were made of the e. m. f. at the common terminals of the machines, the current in the coils of each generator, the power-factor and the output of each machine. Although the results are for only one type of machine, I consider them indicative of the general performance of any generators under like conditions.

The generators were run at a reduced voltage so that their currents would not exceed the rated value. These results, which are correct to within 2 per cent, show a marked agreement with the theoretical results as deduced from the vector diagram. It will be observed that the alternators divide the load approximatelly equally until the field circuit of the one is opened, when the load on that machine becomes negative, and the other slightly increases, which agrees exactly with my statement regarding their behavior. The second machine did not, however, materially alter its speed, and here I wish to modify my statements in the last paragraph, first column, page 1245 of the Dec. 28 issue. As far as their actions as synchronous alternators go it is quite right; but when the first machine attempts to speed up and thus have its field poles rotate at a higher speed than the field due to the armature m. m. f., it is met by the reactive force developed by the eddy currents set up in the pole faces and the armature core. This is the effect that is often made use of in starting small synchronous motors. Of course, for ordinary variations in the field currents the division of the load is not much affected if the prime movers have similar drooping speed-load characteristics.

BOSTON, MASS. WALDO V. LYON.

[Although, as intimated above by Mr. Lyon, an alternator may not always take its full share of the total load when it loses its field excitation, this fact has no direct bearing either on our editorial, to which Mr. Lyon seems not to agree, or on his own article, which was commented upon in the editorial. In the article it was stated that if the field circuit of an alternator is opened, the "entire load is removed from its prime mover," while the editorial pointed out that "an alternator with projecting field poles can carry a considerable load when its field circuit is open." It is probable that the alternators, whose tests are reported by Mr. Lyon, are provided with projecting field poles, but the tests were not conducted under the conditions implied in both the article and the editorial. There can be no doubt that the alternator with open field circuit would have exerted considerable torque and could have carried some load if the excitation of the other machine had been such as to supply the required current for exciting the field magnets. The actual conditions are well described by Dr. C. P. Steinmetz on page 1663 of the *Proceedings* of the A. I. E. E. for November, 1907, where it is stated that, if at constant impressed e. m. f., the field excitation is lowered from that corresponding to minimum armature current down to zero, the machine keeps in step. The field current may even be increased in the reversed direction until there is a very high reversed field excitation, and still the machine runs in step.—EDITORS.]

DIGEST OF CURRENT ELECTRICAL LITERATURE.

Dynamos, Motors and Transformers.

Alternating-Current Commutator Motors.—M. OSNOS.—The first part of his paper read before the Association of German Electrical Engineers on alternating-current commutator motors with special reference to traction. The following motors are considered: First, the conductively compensated series motor; second, the inductively compensated series motor; third, the "inverted" repulsion motor; fourth, the ordinary repusion motor (Atkinson); fifth, the compensated repulsion motor; sixth, the "doubly-fed" motor (the latter term referring to single-phase commutator motors in which the stator field axis and rotor field axis form some angle between zero and 90 deg. with each other, and in which a voltage is impressed on the stator as well as on the rotor). The author first discusses the behavior at starting, and especially the volt-ampere consumption during the starting period. He shows that, with the single exception of the ordinary repulsion motor, all other types, if suitably designed, are of nearly the same quality with respect to consumption of volt-amperes per pound-foot of torque. He then begins to discuss the conditions of sparkless starting.—*Elek. Zeit.*, Jan. 2.

Reluctance of Air-Gap.—T. F. WALL.—An illustrated paper read before the Manchester Section of the (British) Institution of Electrical Engineers on the reluctance of the air-gap in dynamo machines. The author gives the results of a series of experiments on the distribution of flux with varying proportions of air-gap, tooth and slot. The tests have been made with a special model apparatus from which the results in predetermining machine characteristics are deduced.—Lond. *Elec. Eng'ing*, Dec. 19.

Operation of Alternators in Parallel.—G. BENISCHKE.—An article in which the author criticises a theory of Emde and others on the reasons which cause surging of alternators, and describes a case from practice which shows that that theory is not correct. In the case in question surging of alternators was observed, although according to the theory they should have operated perfectly well in parallel. The weight of the fly-wheel was then greatly increased, but without much effect. Satisfactory operation in parallel became possible only after changes had been made in the regulation of the gas engines. The connection of choking coils in series is not always effective.—*Elek. und Masch.*, Dec. 29.

Lamps and Lighting.

Connection of Leading-In Wire for Metallic-Filament Lamps.—An article on a British patent of the Westinghouse Metal-

Filament Lamp Company for using the aluminothermic method for making a durable conducting connection between the metallic filament and the leading-in conductors. The joint consists of a metallic alloy produced at the point of connection. A mixture of the oxides of the metals which are to form the joint, with aluminum or magnesium, etc., with a suitable liquid or flux, is placed around the connecting points of filament and leading-in conductor. The ends of the leading-in conductors may be provided with hoops or loops, and the filament is thrust into these; the connecting points are then covered with the mixture described above, and the aluminothermic reaction is started either by means of the electric current or in some other way. The aluminum combines with the oxygen of the oxides and by the heat evolved by the reduced metals are fused together with the ends of the filament and the leading-in conductors. The alumina forms a filament on the outside of the joint, which may be removed, if desired, by dipping into hydrochloric acid. The liquid or flux employed with the mixture "should be such as will not exercise an injurious effect upon the material. Thus, for example, instead of employing water with calcium, alcohol or some other organic compound should be used, and, on the other hand, with aluminum, a solution of mercuric chloride or some other suitable salt of mercury may be used."—Lond. *Electrical Eng'ing,* Jan. 2.

Radiation of Osmium.—L. Leder.—An account of a determination of the energy-flow curve of radiation of osmium in the visible spectrum. The author finds that the total intensity is that of an absolutely black body at a temperature of 2195 deg. C. absolute, and this temperature is, therefore, an inferior limit of the probable temperature of osmium. It is not very far removed from the melting point of osmium. Since the emissivity and the reflective power of osmium are not accurately known, the true temperature is difficult to determine. The author, therefore, assumes certain temperatures, and from them he calculates the emissivity with the help of the observed curves of intensity. He constructs a table showing the ratio of the actual radiation to the radiation of the ideal black body for various wave-lengths and temperatures. From this table the following figures are extracted:

Degrees, C. absolute	WAVE LENGTHS—ω ω			
	643	550	474	430
2200	0.980	0.944	0.931	0.971
2300	0.633	0.570	0.517	0.508
2500	0.293	0.233	0.181	0.161

For platinum at 1975 deg. absolute the first three figures would be 0.319, 0.340 and 0.368. These results show that the dependence of the emissivity upon the wave-length has opposite courses in osmium and in platinum. The emissivity of osmium is considerably greater than that of gold or silver, and most likely also greater than that of platinum. It is, however, unlikely that the melting point of osmium is as high as 2600 deg. C. absolute.—Abstracted from *Ann. der Phys.,* No. 12, in Lond. *Electrical Engineering,* Dec. 26.

Church Lighting.—A fully illustrated article on the electric lighting of Manchester Cathedral, giving details of the arrangement of the lamps and fittings. The fundamental principle was to render the means for lighting as unobtrusive as possible.—Lond. *Elec. Eng'ing,* Dec. 19.

Power.

Electric Power in a German Mine.—An illustrated description of the new electric equipment of the Clausthal mines. The chief features are an underground direct-current locomotive, a winding plant in one of the smaller shafts, and the main-shaft winding plant. In the latter case the peak load is delivered by the use of storage batteries and not by a fly-wheel set.—Lond. *Elec. Eng'ing,* Dec. 26.

Electric Cranes.—H. H. Broughton.—A continuation of his long illustrated serial. The author deals in the present installment with mechanical brakes fitted with electromagnetic release and describes some standard constructions of English makers.—Lond. *Electrician,* Dec. 27.

Power from Peat.—A. P. Lennox.—An abstract of a lecture before the Dublin section of the (British) Institution of Electrical Engineers on the preparation of peat for use in gas producers for the production of electrical energy. A special form of grab dredger and drying apparatus designed by the author are described.—Lond. *Elec. Eng'ing,* Dec. 26.

Gas Producer.—O. Nagel.—An article on the Jahns system of transforming solid fuel into gas. The main features of the system are that no fuel is charged into the producer during the time of gasification and that a number of producers are connected by means of channels to one unit. The arrangement is fully illustrated by diagrams.—*Electrochem. and Met. Ind.,* January.

Traction.

Train Resistance.—C. A. Carus-Wilson.—An abstract of a paper read before the (British) Institution of Civil Engineers. The resistance equation is of the form $R = A + Bv + Cv^2$ where v is the speed. The resistances included in A are independent of the speed and include journal friction, rolling friction and track resistance. The resistances comprised in Bv include the resistance caused by flange action, which varies directly as the speed. The resistances comprised in Cv^2 include all forms of air resistance, which vary as the square of the speed. The author then discusses the determination of the constants in this equation and finally arrives at the following practical conclusions: The real value of roller bearings in railway traction is shown to lie in the reduction of running resistance and consequent saving of energy, and not in the reduction of starting effort. The results of tests with roller bearings on the Eastern Bengal State Railway are given, the saving actually obtained being 1 per cent greater than that calculated by the use of the resistance formula. The resistance of a coach is shown to depend largely upon the wheel base of the truck, and the relation of the weight of the bogie trucks to that of the whole coach. The weight of the motors and the extra weight of the motor trucks in electrically driven coaches increases the flange action and the total resistance of such coaches. The resistance of electrical motor coaches is in some cases as much as 54 per cent greater than that of trailing coaches running at the same speed under similar conditions. The influence of the bogie on train resistance is shown to be greatest in the case of drays. Since flange action depends upon the ratio of the weight of the bogie to that of the whole wagon, it must follow that the resistance per ton of a loaded bogie wagon must be less than that of the same wagon empty. The ratio of the mean draw-bar pull in two cases was found to be 0.56. The energy expended in overcoming flange resistance is represented by the wear of tires and rails. It is shown that by giving the bogie a lead, as is done in Timmis's bogie lead, the flange action of the bogie can be reduced, and that the saving depends upon the ratio of the bogie wheel base to the distance between the bogie centers, and also upon the ratio of the bogie weight to the total weight. The amount of play between the flanges and the rails is an important factor in train resistance. The resistance of the air with a train of bogie coaches, running at 60 miles per hour, amounts to about one-half of the total tractive effort required to haul the train. The experiments conducted by the St. Louis Electric Railway Test Commission show that a large reduction can be made in the front and rear air resistance by properly shaping the ends, and that by this means a saving can be effected of 10 per cent of the total tractive effort with a long passenger train, and 30 per cent with a single coach.—Lond. *Electrician,* Dec. 27.

Single-Phase Traction.—V. E. Walters.—A paper read before the Birmingham and District Electric Club on recent developments on single-phase motors for industrial purposes (lifts, cranes, etc.) and traction. The author describes various new industrial applications of the single-phase motor and discusses the principal different types which have been developed.—Lond. *Electrical Engineer,* Dec. 20.

Single-Phase Railway.—An illustrated description of the new Brembana Valley single-phase railway in Italy, which has been mentioned in the Digest.—Lond. *Electrician,* Dec. 27.

Berlin Subway.—E. C. Zehme.—An article discussing the pro-

ject of a sudway in Berlin, with reference to reports of Kemmann and Cauer.—*Elek. Zeit.*, Dec. 19.

Installations, Systems and Appliances.

Electric Monopoly in Germany.—BUDDE.—Notes on a proposed electric monopoly in Germany have appeared in various German newspapers and the scheme appears to be favored by officials of the government and an influential political party. It is proposed that the German government should undertake the generation and distribution of all electrical energy used in Germany for lamps, motors, tramways, etc. (the telegraph and telephone system being already in the hands of the government). The manufacture of electric machinery and apparatus would, however, not be taken over by the government. The writer shows the great dangers of such a proposition, and urges that in these times of bad financial crisis the industry, as the biggest taxpayer of the country, should be treated with more consideration and caution, and should be left alone.—*Elek. Zeit.*, Jan. 2.

Derby.—During the last years the growth of the demand for electric energy at Derby has been so rapid that a new station had to be erected. The old station contained some 4500 kilowatts of equipment, part of which generates single-phase alternating current at 40 cycles per second, and part continuous current at 2×230 volts for lighting in the central portion of the town, and 500 volts for the traction load. The new station, which is on a site adjoining the old one, will at first be equipped only with direct-current plant, which will be run in parallel with the three 300-kw direct-current turbo-generators erected in the old station in 1904, and a 500-kw set erected in 1906. When these latter were put in, the central portion of the distributing network was converted from the alternating-current transformer system to the three-wire direct-current system. No new alternating-current plant is being put in, and the radius of the direct-current area is being gradually increased. The equipment of the new plant is described and illustrated.—Lond. *Elec. Engineering*, Dec. 19.

London.—Details of the proposal, which is to be submitted to the British Parliament, for placing the whole of the electrical supply companies of London under one management. The bill, which is promoted by the companies themselves, provides for the working of all these undertakings by a joint committee, and the ultimate purchase in 1932 or 1952 by an authority to be created by Parliament for the purpose. Particulars are also given of an alternative scheme promoted by a new company, independent of the above proposal, and not having the support of the existing companies.—Lon. *Elec. Eng'ing*, Dec. 26.

Troppau.—O. ARMKNECHT.—The first part of an illustrated article on the electric station of the city of Troppau, in Austria. The plant supplies energy for lamps and motors, as well as for traction. On account of the comparatively small area to be covered, the three-wire direct-current system has been chosen. There have been installed two 155-kw dynamos and a battery of 95 kilowatts maximum output, and for traction two 55-kw generators and a battery of about 50 kilowatts maximum output.—*Elek. Zeit.*, Jan. 2.

Rules and Regulations.—An English translation of the recently revised rules of the German Association of Electrical Engineers for overhead wires, cables and electric wiring.—Lond. *Electrician*, Dec. 27.

Wires, Wiring and Conduits.

Alternating-Current Transmission in Cables.—C. V. DRYSDALE.—A continuation of his long paper. In the present installment he gives the simple exposition of A. E. Kennelly's methods of calculating the transmission of an alternating current over a long cable.—Lond. *Electrician*, Dec. 27.

Electrophysics and Magnetism.

Relation of Mass to Energy.—D. F. COMSTOCK.—A highly theoretical paper. "The electromagnetic mass of an isolated, symmetrical, purely electric system possessing any structure which on the average remains the same, and any internal motions or constraints, is expressible in terms of its velocity as a whole through space, together with its 'transverse energy,' and the derivative of the latter with respect to the velocity. If second-order terms in the velocity be neglected, the mass is a simple constant multiplied by the total included electromagnetic energy." If the mass of ponderable bodies has an electromagnetic origin, then the inertia of matter is to be considered merely as a manifestation of confined energy. From this point of view, matter and energy are thus very closely related and the laws of the conservation of mass and energy become practically identical. The loss of mass, inevitable on this view, which takes place when energy is lost to the system, is large enough to be detected in the case of radioactive changes. If we assume the disintegration theory of the elements, this loss of mass affords a ready explanation of the general, small irregularities to be found in the list of atomic weights, and thus removes a serious difficulty from the path of the disintegration theory. For this loss of mass to take place, however, it is not necessary that the whole of the mass be electromagnetic. If material mass be electromagnetic, and if lighter elements are formed from heavier ones through violent energy changes, it follows that gravity acts between quantities of confined energy, and not between masses in any other sense. Several speculations are indulged in as to the results of assuming gravitation between quantities of energy.—*Phil. Magazine*, January.

Heusler Alloy.—A. D. Ross.—A paper read before the Royal Society of Edinburgh on Heusler's copper-manganese-aluminum alloy, and the effect of different heat treatments on its magnetic properties.—Lond. *Electrician*, Dec. 27.

Electron Theory.—G. A. SCHOTT.—A highly mathematical paper on the electron theory of matter as applied to the explanation of magnetic properties.—*Phil. Magazine*, January.

Magnetic Induction.—D. N. MALLIK.—An account of an experimental determination of magnetic induction in an elongated spheroid.—*Phil. Magazine*, January.

Electrochemistry and Batteries.

High-Grade Steel in the Electric Furnace.—In an account of a paper by Thallner on the possibility of absolutely controlling the slag in an electric steel furnace for the complete purification of the metal, the diagram reproduced in Fig. 1 is given, showing

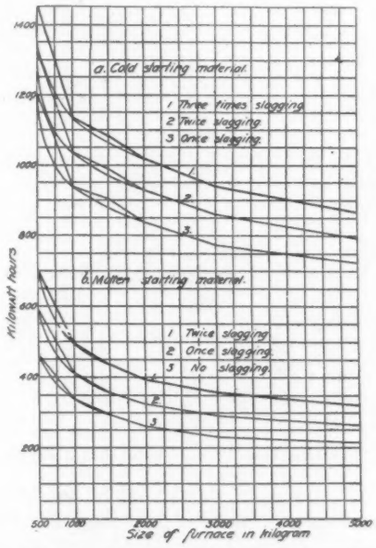


FIG. 1.—ENERGY CONSUMPTION CURVES.

the consumption of electrical energy necessary to refine one ton of steel in the Heroult furnace, both when starting with cold and molten material. The curves give the consumption of energy for different sizes of the furnace and under different conditions of operation. The great economy of starting with a molten material from the converter or open-hearth furnace is shown, also the decrease of energy with the size of the furnace. In the electric furnace it is possible thoroughly to dephosphorize, desulphurize and deoxidize the metal.—*Electrochem. and Met. Ind.*, January.

The Evolution and Devolution of the Elements.—A. C. AND A. E. JESSUP.—From the recent observations on radioactivity it

appears that some elements are degrading into simpler forms of matter, elements of high atomic weight changing into such of lower atomic weight. On earth we have not yet any evidence of the reverse process, namely, evolution of elements with low atomic weight into other elements with a higher atomic weight. The authors endeavor to produce evidence of such an evolution from astrophysical observations. The nebulae contain only a few elements of low atomic weights, but as the nebula becomes more compact and assumes the form of a star, more complex elements appear. If we consider Mendeleef's table of periodic system, it may be assumed either that the elements evolve in order of atomic weight along horizontal lines of the table of the periodic system, or that they evolve in groups; that is, down its vertical columns. The authors think that they have strong reasons for believing that the second method has most evidence in its favor. They have drawn up a modified table of the periodic system.—*Phil. Mag.*, January.

Electrochemical Analysis.—A. M. Fairlie and A. J. Bone.—A fully illustrated article on a system of electrochemical analysis with rotating anodes as developed for the routine practice of a large industrial laboratory.—*Electrochem. and Met. Ind.*, January.

Units, Measurements and Instruments.

Weston Cadmium Cell.—A paper from the (British) National Physical Laboratory. He thinks that the method of making mercurous sulphate used as a depolarizer is immaterial provided that certain conditions are observed, and his guiding principle in the manufacture of the salt and the preparation of the paste is to prevent hydrolysis by keeping the salt in contact with dilute sulphuric acid (1 to 6), or with saturated cadmium sulphate solution. The size of the crystals of the depolarizer has an effect. The uniformity in the size of the crystals is most marked in samples prepared by the method of chemical precipitation, mercurous nitrite being added to sulphuric acid, and this is recommended as a standard method of preparation of the salt. The lag of e. m. f. with temperature coefficient for the range, from 10 deg. C. to 30 deg. C., is given by the following equation:

$$E_t = E_{17} - 3.48 \times 10^{-5} (t - 17) - 0.066 \times 10^{-5} (t - 17)^2$$

That is in very good agreement with the formula given by the Reichsanstalt.—Lond. *Electrician*, Dec. 27.

Determination of Self-Induction Coefficient.—The method of determining inductances by connecting the coils in series with non-inductive resistors and noting the voltage drop across each when a sinusoidal alternating current is passing, may be simplified into a single reading by employing an electrometer connected differentially, as shown in Fig. 2. Quadrants 2 and 4

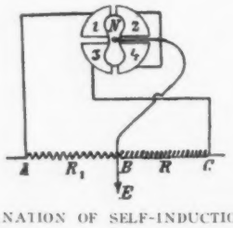


FIG. 2.—DETERMINATION OF SELF-INDUCTION COEFFICIENT.

are connected together and to the needle, as well as to the junction point B of the inductive and non-inductive resistors and to earth at E. The end of the resistor A is connected to quadrant 1, and that of the inductances C to quadrant 3. When the potential difference between A and B is equal to that between B and C, two equal and opposite torques act on the needle N, and it, therefore, rests in the zero position. This result is attained by adjusting R_1. The R_1 and R (the resistance of the inductance coil) being known, as well as the frequency n, the coefficient of self-induction L can be found from the expression $L = \frac{1}{2\pi n}(R_1^2 - R^2)$. The sensitiveness of the instrument increases with the voltage between A and C, so that the method does not permit of great accuracy when dealing with low resistances. For determining the inductance of telegraphic coils, induction coils, etc., it is, however, very suitable. The current supply may be advantageously obtained from a small alternating current generator at from 20 to 30 volts.—Lond. *Elec. Engineering*, Dec. 20.

Improved Current Balance.—A description of the new current balance, which has been erected at the (British) National Physical Laboratory, and which has now been in use about two years. The design is due to Ayrton, Mather and F. E. Smith. The instrument consists of a sensitive physical balance with a 20-in. beam, carrying about 5½ kilos and turning with 1/10 milligram supporting from each end a coil with vertical axis; these coils hang coaxially within fixed coils carried from the base. Details of the winding of the coils are given. The mutual inductance of all the coils was computed at 51,922.47 cm., which leads to the result that one ampere on reversal in the two sets of coils causes a change of balancing mass of 14.9928 grams.—Abstracted from *Proc. Royal Soc.*, December; in Lond. *Elec. Eng'ing*, Dec. 26.

Variable Mutual Inductance.—A. Campbell.—His (British) Physical Society paper in full, which has already been noticed in the Digest, on the construction of coils, variable mutual inductances and their use for certain measurements.—*Phil. Magazine*, January.

Induction Variometer.—H. Hausrath.—An illustrated description of two types of variable self-induction apparatus for measurements by a differential method.—From *Zeit. f. Instrumentenkunde*, 1907, No. 10, abstracted in Lond. *Electrician*, Dec. 13.

Determining the Power Factor.—F. Kuderna.—An article describing a brief graphical method for determining the power factor from the readings of the two wattmeters employed in the measurement of the power of a three-phase system.—*Elek. und Masch.*, Dec. 22.

Telegraphy, Telephony and Signals.

Sound for Controlling Operations at a Distance.—J. Gardner.—An illustrated article describing a method of closing or opening an electric circuit at a distance by means of sound. The method seems to be especially suitable for submarine signalling to warn vessels of their position in relation to fixed points. For this purpose water is the transmitting medium, and it is very effective. For shorter distances air is also a suitable medium of transmission. The transmitting apparatus is a bell or something similar. The receiving apparatus consists primarily of a vibrator, preferably in the form of a strip of steel tape mounted by one or both ends upon a part, such as the plating of a vessel, which is exposed to the arriving sound. The vibrator is tuned to the distant sound and reacts strongly only to this pitch. A carbon pencil microphone is mounted on the sound-receiving vibrator and the pencil is given such weight and dimensions as will permit it to vibrate with the strip upon the reception of any note not corresponding with the natural period of the strip, but to remain stationary relatively to the vibrator when this is affected by a sound which it is prepared to amplify by resonance. With silence or with an unsuitable note, the pressure of the pencil is, therefore, constant, but upon the arrival of a sound in agreement with the pitch of the vibrator amplification follows, and the intimacy of contact of pencil and vibrator is diminished. Both of these parts are in circuit with a source of very low voltage, and with the winding of the magnets of a polarized relay of very high resistance. The relay is so adjusted that the full or normal current existing during quiescence of the microphone is just sufficient to hold the tongue in the position in which, in ordinary telegraph work, the local circuit governed by the relay would be closed. In case of disturbance of the microphonic contacts the tongue is released and the local circuit is closed and remains closed as long as the proper sound reaches the vibrator and the disturbance in the microphone continues. Drawings are given of the apparatus and in a note the editors state that they can vouch for the inventor's statements as to the working of the model of the apparatus.—Lond. *Elec. Review*, Dec. 13.

Propagation of Telephone Currents.—H. Abraham and

DEVAUX-CHARBONNEL.—A paper presented before the French Academy of Sciences on the propagation of telephone currents in underground lines. The object of the experiments was to examine whether the propagation on real lines is presented with sufficient exactness by the classical formulas of theory. The tests were made with alternating currents at from 250 to 500 cycles per second, and the e. m. f. applied was of the order of one volt or less. The experiments were made on the underground lines of Paris consisting of copper wire, 1 mm. in diameter, insulated with paper. The results are in a remarkably good agreement with the theoretical formulas.—*L'Industrie Electrique*, Dec. 25.

Automatic Telephone Exchange.—F. LUBBERGER.—An article describing some recent applications of the Strowger automatic telephone system for extending and reconstructing some existing telephone exchanges.—*Elek. Zeit.*, Dec. [illegible]

Undamped Oscillations.—H. T. SIMON.—A note on the action of the magnetic field in the production of undamped electric oscillation with the aid of an arc. The author points out that anything which increases the potential at which the arc is started must increase the energy of the oscillations. Cooling of the electrode, use of a hydrogen atmosphere, and the employment of a magnetic field, all act in this way. The magnetic field blows ions out of the field and lengthens the conducting path into a long arc of increasing resistance until the direct path from electrode to electrode becomes again the easier one and a new arc is started.—*Elek. Zeit.*, Dec. 26.

Magnetic Oscillators.—J. A. FLEMING.—His full (British) Physical Society paper on the closed or magnetic type of oscillator, as distinct from the usual open or electric type, and its use in wireless telegraphy. The effects observed vary in a remarkable degree according to the positions of the transmitter and receiver in relation to one another and in relation to the earth.—Lond. *Electrician*, Dec. 27, Jan. 3.

Gasoline-Electric Car for Railway Service.

The gasoline electric car illustrated herewith has been built by the General Electric Company and subjected to service tests on the Delaware & Hudson Railroad, between Schenectady, Delanson, Albany, Troy and Mechanicsville. The car was designed throughout with special reference to the service required, the main object in view being to secure the maximum carrying capacity with minimum weight, and at the same time to have a car of great strength. The shape of the ends is parabolic in order to reduce the air resistance to a minimum when traveling at high speeds. The framework of the roof and sides is made of T-irons, while the exterior is of steel plate.

The car is equipped with two 60-hp direct-current motors fed with energy at variable voltage obtained from a special generator.

Principal interest in the equipment centers around the gen-

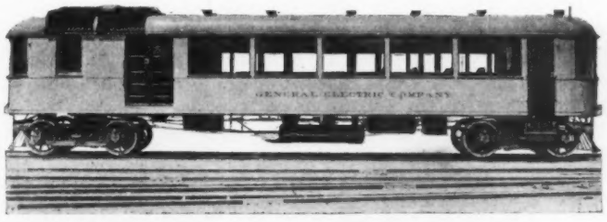


FIG. 1.—GASOLINE-ELECTRIC CAR.

erator and its driving engine. The engine is an eight-cylinder gasoline machine, which at 550 r. p. m. develops 100 horsepower. The cylinders are placed at 90 deg. to one another, and at an angle of 45 degrees to the horizontal, as shown in Fig. 2. The cranks are so set as to give a satisfactory system for balancing purposes. An effectual means for overcoming the difficulties of starting the engine from rest has been found in the use of a special breech-block mechanism, which allows a charge of black powder to be fired into one of the cylinders.

The generator is a 90-kw, 8-pole, separately-excited unit, which has been specially designed with a view to procuring the lightest possible machine for the necessary output, and at the same time keeping the temperature rise to within a reasonable figure. It is provided with commutating poles, which, in conjunction with the potential type of control, gives a great flexibility of output. The advantage of this arrangement will be readily appreciated when it is pointed out that at starting the field excitation is weak, and that large currents are required to give the necessary starting torque. The normal pressure when running at 550 r. p. m. is 250 volts, at which time the current may amount to 360 amperes, but at starting a current of 800

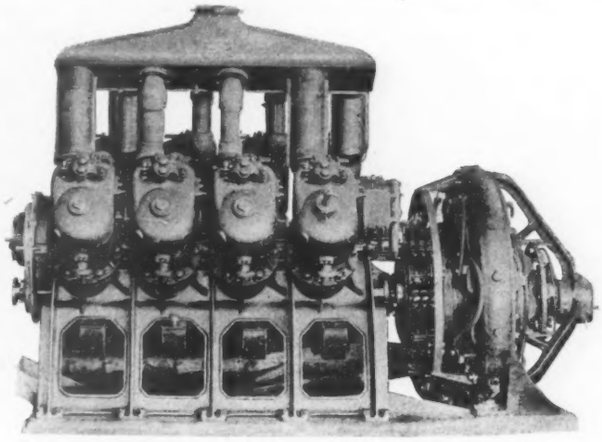


FIG. 2.—GASOLINE ENGINE DIRECT-CONNECTED TO COMMUTATING POLE GENERATOR AND SEPARATE EXCITER.

amperes can be secured at a corresponding decrease in voltage. It would be impossible to commutate so large a current in a machine with so great an output per pound without the use of commutating poles.

The total weight of the generator, including the 3-kw shunt-wound exciter, is only 2740 lbs., while a standard 90-kw machine weighs 8800 lbs. As is only natural in a machine where the weight has been so materially reduced that the temperature rise is higher and the efficiency lower than in standard apparatus of the same output. The higher temperatures are fully provided for by the type of insulation employed; there is no paper or muslin used anywhere in the machine. The armature coils are insulated with mica, the commutating pole coils with asbestos, and the field coils are wound with enamelled wire. The armature leads to the commutator are riveted as well as soldered, although the precaution has been taken to use pure tin for soldering, the melting point of which is over 200 deg. C. Air ducts of ample dimensions are provided to insure a large volume of air being circulated through the core. The efficiency is 88 per cent, being only about 3 per cent lower than a standard machine having a temperature rise of 35 deg. C.

A storage battery, which is connected permanently in shunt with the exciter generator, is used for supplying energy to the lighting circuits. A Tirrill regulator holds the voltage constant on the lighting circuits, while a rheostat in series with the field coils of the main generator allow its voltage to be varied at will. The two motors are connected in series or in parallel, according to the speed desired, but the usual series resistance is omitted.

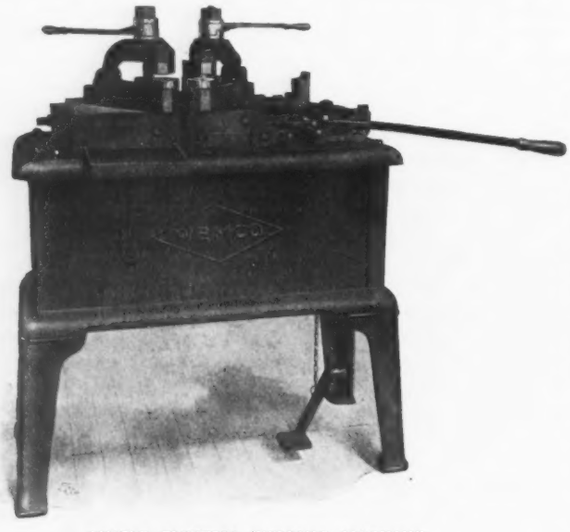
During a recent test of the car over 78 route-miles in the neighborhood of Albany, Schenectady and Mechanicsville, fully loaded with passengers, the speed varied from 23 miles per hour on a 1.3 per cent up-grade to 56 miles per hour on a 25 per cent down-grade, with 50 miles per hour on a level track. The operation of the equipment was satisfactory in every way, neither vibration nor sound of the engine reaching the passengers. The car was heated readily from the exhaust system, although the day was cold and the air keen. The two motors were under such perfect control of the operator that the acceleration was noticeably smooth and free from jerks.

Electric Welder.

The welding machine illustrated herewith is so arranged that an enormous value of current at very low voltage exists at the abutting ends of the pieces to be welded. The heat produced at the high-resistance point of contact quickly raises the temperature to the welding point. The machine receives its supply of energy from alternating-current circuits at any convenient potential. The following table gives the power, the time and the energy required for welding various sizes of iron and steel:

Round in. dia.	Power. hp.	Time, sec.	Energy, hp-sec.
.25	2.0	10	20.0
.50	6.5	21	136.5
.75	13	31	403
1.00	22	40	880
1.25	33	50	1650
1.50	45	60	2700
2.00	68	81	5508

The power stated above is the value at the generator while the time is that required solely for the use of the electrical energy.



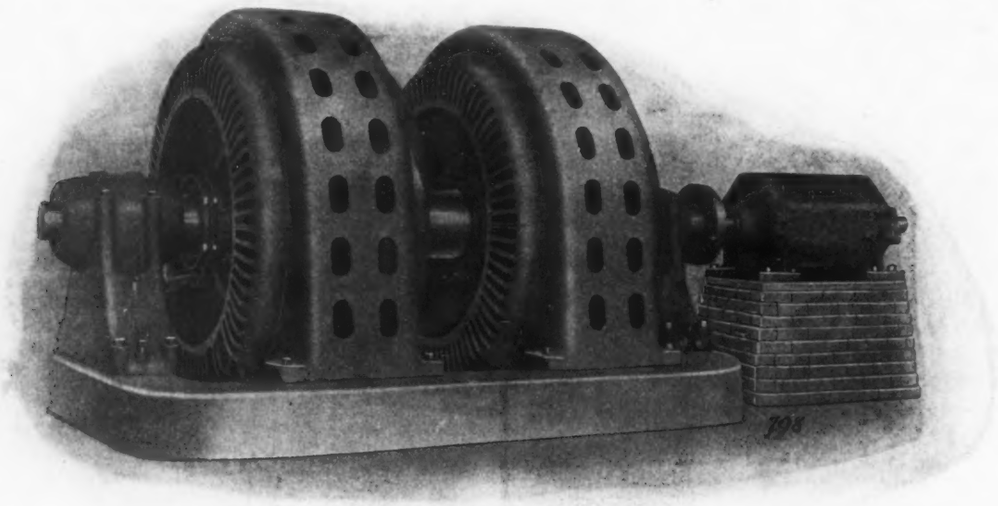
SINGLE ELECTRIC WELDING MACHINE.

A square piece requires from 25 to 50 per cent more power and from 12 to 50 per cent more time than does a round piece equal in diameter and the side of the square. Copper pieces require from two to three times as much power and only from 50 to 70 per cent as much time as does an iron piece of the same size.

The above described welder is built by the Warren Electric Manufacturing Company, Sandusky, Ohio. Machines are made both for single welding and for double or T-welding.

Frequency Converter.

The accompanying illustration shows a Crocker-Wheeler frequency converter set installed in the Pennsylvania Steel Company's plant at Steelton, Pa. The set consists of a 14-pole synchronous motor mounted on the same shaft with a six-pole alternating-current generator and directly coupled to a direct-current starting motor. It is used to change the frequency from 60 cycles to 25.7 cycles. It is driven by energy received from the circuits of the York Haven Power Company, and generally carries a part of the load of the steel company's plant independently of its power plant.



FREQUENCY CONVERTER WITH STARTING MOTOR.

Arc Lamp for Photographic Purposes.

The accompanying illustration shows the Jupiter lamp for photographer's use introduced by Felix Hamburger, of 78 Fifth Avenue, New York. The lamp differs from other lamps used for this purpose in that the light is produced by a brilliant flash across a pair of arcs, thus making it possible to take instantaneous photographs in the dark or indoors, a feat hitherto possible only outdoors on a bright day and indoors by the use of some form of flash powders, which filled the place with objectionable smoke. The series of operations by which the arcs are struck is automatically performed by the lamp mechanism and follows when the operator presses a bulb at the camera.

As shown in the illustration, a parabolic reflector has eight 32-cp frosted bulb incandescent lamps arranged around its circumference and at the focus of the parabola, a double arc having three carbons in the same horizontal plane. These are held by three arms, the two outer arms being adjustable through regulating mechanism at the rear. The arcs are struck through the intervention of an electromagnet for snap-shot work and for time exposures the carbons may be fed by hand by means of a flexible shaft. Another flexible shaft is provided for tilting the reflector, which is capable of universal adjustment. The lamps are connected by a cable to the regulating apparatus, which is suitably mounted in an iron box. The switching and regulating apparatus consists of a suitable resistance, the regulating mechanism for time exposures and the switching devices for snap-shot work. The last is an electrically operated contact maker which cuts out a great portion of the lamp resistance.

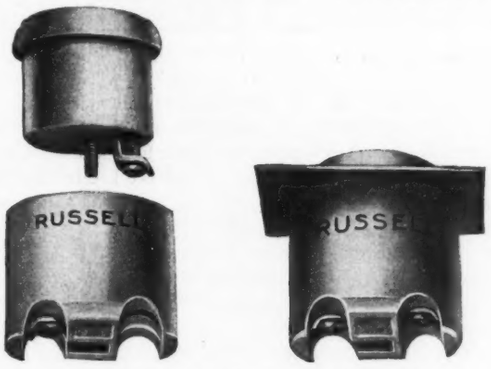
The great brilliance of the light from the two arcs is responsible for a high development of actinic rays, while the

FIGS. 1 AND 2.—ARC LAMP FOR PHOTOGRAPHIC PURPOSES.

rapidity of the exposure precludes the possibility of any movement on the part of the sitter from effecting the plate. The arcs are shielded by a conical, frosted-glass screen, and since the focus is taken by means of the eight 32-cp lamps, the eye of the sitter accommodates itself to the brilliance so that when the arcs flash the eye does not shut nor possess that startled appearance so noticeable in flash-light work. Moreover, the effect produced by the focusing screen is almost identical to the effect produced by the arcs, so that this may be taken as that produced on the photographic plate.

Labor-Saving Sign Receptacle.

The receptacle illustrated herewith is used for metal-faced signs, or for outlet boxes to be fastened to the covers. It is installed by placing the smaller porcelain piece through a hole in the face of the sign, or in an opening in the cover, and the larger piece is slipped on at the back, and the central contact screw is then tightened. All contacts are thoroughly protected.



FIGS. 1, 2 AND 3.—RUSSELL RECEPTACLE.

It is stated that the receptacle is weatherproof, and can be used to great advantage on account of the small surface occupied.

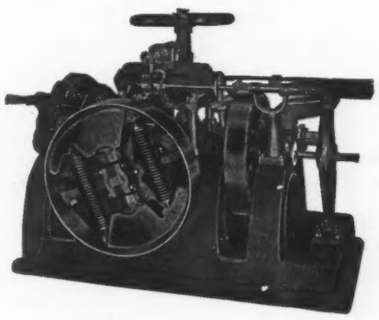
The Russell sign and outlet box receptacle has been approved by the Underwriters. It is manufactured by the E. H. Freeman Electric Company, Trenton, N. J.

Water-Wheel Governor for Large Units.

The two types of improved governors which the Holyoke Machine Company, of Worcester, Mass., has had upon the market for the past five years, have met with such success that the company has just placed on the market a larger model which will be known as Type "C." Owing to the increased size of hydroelectric units installed or under construction at the present time, the company decided to build governors powerful enough to handle these units and thus to keep abreast of hydroelectric developments. The new and larger type of governor is capable of exerting 75,000 ft. lbs. of energy in four seconds and it is possible to increase this energy to 100,000 ft. lbs. by increasing the time element of the governor, or in other words by making the governor act in about six seconds.

The governor is designed with a special hand wheel arrangement which will make it practicable for one man at the hand wheel to apply a force equal to that exerted by the governor in case it is necessary to operate the gates of the wheels by hand in emergencies.

The governor is designed along the same general lines as the other governors built by the company. One of the principal advantages of the Type "C" governor is the fact that although the governor exerts a large amount of energy, the size of the pumps and cylinders used in connection with the friction clutches, have not been increased. Other advantages are as follows: The governor is provided with a special



WATER-WHEEL GOVERNOR.

device which is arranged so that the relaying effect may be varied at various stages of the gate opening, thus making it possible to handle the hardest kind of load changes and maintain a close speed regulation of the unit. The device is also designed so that the time element of action may be varied to meet the different conditions caused by the action of water flowing through long feeders. The time required by the governor to open or close the gates can be considered in connection with the proper speed at which the gates should be moved, in order that the gates shall move no faster than the water will follow under natural conditions. This timing element obviates the tendency to race and the governor may be installed without endangering the feeders by the action of the water, caused by rapid closing of the wheel gates. The governor is provided with a synchronizer which may be operated from any desirable point in order to phase machines, and also has attachments so that it may be made to run in parallel with other machines. The governor may be provided with an electrical stop which will enable the operator to shut the unit down in case of emergency, from buttons located at various points about the power plant or mill. Lately a device has been added which is used when the water-wheel is running in connection with steam units so that the water-wheel will use all the available water up to the capacity of the wheels on which the governor is in use and not allow any to pass over the dam.

This allows the engine to supply the necessary power and to keep the speed at normal, making the water-wheel governor open the gates only the amount necessary to use the available water.

Exhibits at the Chicago Electrical Show.

For the convenience of readers the following report of exhibits at the Chicago Electrical Show has been arranged to bring together, so far as possible, descriptions of exhibits of the same class:

INCANDESCENT LAMPS.

The tungsten lamp exhibits were the great features of the show from an electrical man's standpoint. The first exhibit of American made tungsten lamps was at the 1907 show. The 1908 show marks the placing of the lamp on the open market in quantities showing that the year has brought the lamp from the curiosity stage to that of a regularly manufactured article, with a good number in stock in Chicago houses.

The National Electric Lamp Association engineering department flooded its exhibit and vicinity with light from a large number of 40-watt, 32 horizontal candle-power tungsten lamps. This is the size of tungsten lamp which the companies of the National Electric Lamp Association are turning out in the largest quantity. Most of these tungsten lamps were shown in bowl Holophane reflectors, as a deep reflector is almost inoperative with the high candle-power and high intensity of the tungsten lamp, in order to reduce the brilliancy to a comfortable point. Some tungsten lamps were also placed on the festoons over the booth which formed a part of the regular decorative lighting scheme of the Coliseum. The color of these lamps was in marked contrast to those of the common carbon filament lamps in the rest of the building and was noticeable from all parts of the building. The color contrast between the tungsten lamp and the common incandescent was further even more strongly brought out by various color tests offered to visitors in the booth. Several boxes were provided in which there were dry goods, which could be lighted by either common carbon or tungsten filament incandescent lamps. By means of a snap switch the tungsten lamps would be turned on one instant and the common carbon lamps the next instant. In another piece of apparatus a part of a picture would be shown under the light from the tungsten lamp and another part was shown under the common incandescent lamp. Pictures and goods containing much blue were shown much better under the tungsten lamp. In fact, the common carbon lamp appeared to almost kill the color effect of some delicate blue tints. It was thus practically demonstrated that, in addition to a reduction of 40 per cent in current required over the most efficient common carbon filament lamps, the tungsten lamp has another important advantage in having a color approaching nearer to daylight.

The General Electric Company showed principally tungsten lamps of 100 watts and 80 mean horizontal candle-power, this being the size which the Edison Lamp Works have so far been principally turning out. Some of these were shown in enameled bowl reflectors which gave a beautiful diffusion.

The G. I. tungsten lamps in 40 and 60 watt sizes were on exhibition in M. B. Austin & Co.'s booth, which company now has a stock of these lamps in Chicago.

The Moline Incandescent Lamp Company exhibited 100, 75, 50, 40 and 20 candle-power Gem metallized filament lamps.

The Excelsior Supply Company exhibited six-volt four-candle tantalum lamps. These lamps are supplied with current by storage batteries and are intended for use in making repairs on automobiles or for temporary lighting in house closets or wardrobes or other confined space where the use of matches introduces a fire risk.

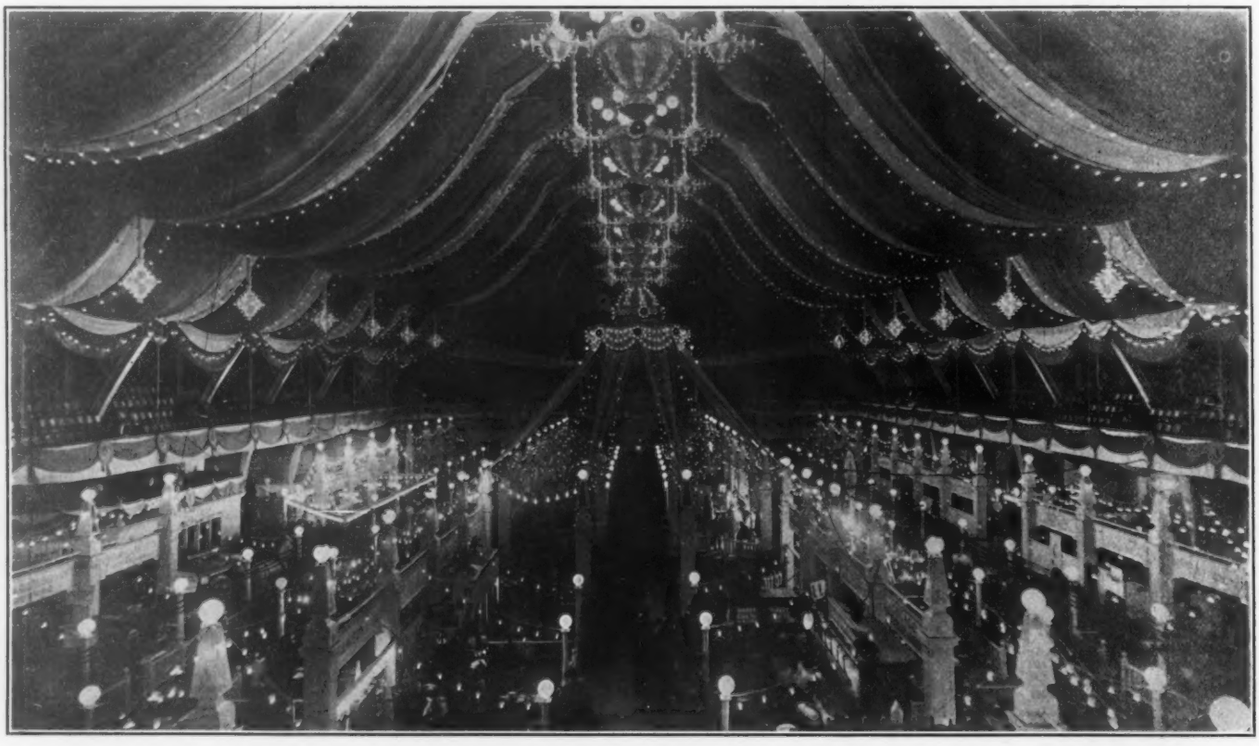


FIG. 1.—GENERAL VIEW OF CHICAGO SHOW; CENTER AISLE.

The "Linolite" tubular lamp, which has been manufactured in England for some time and has just been put on the market in this country, was exhibited for the first time as an American product by the H. W. Johns-Manville Company. In the "Linolite" system the lamps consist of tubes, with brass terminal caps on each end. The filament extends from one end of the lamp to the other, with anchors at two points and a slight spiral in the middle to provide for contraction and expansion. The lamp fits in between terminal blocks, every alternate block being positive and the others negative. The terminal blocks were fastened in an aluminum trough reflector, the edges of which are curled over to form a metal conduit for the wires. The arrangement is

very compact and substantial. The system is specially adapted to the lighting of show cases, pictures and book-shelves, where the size of ordinary trough reflectors is objectionable. Each lamp is 1 ft. long and is the equivalent of a common 16-cp incandescent lamp in wattage. A common carbon filament is used in the lamp.

The American Electrical Novelty & Mfg. Company had on exhibition for the first time a high candle-power "Osram bulb," a miniature lamp connected to a dry battery for use in mines, etc. The company claims for this lamp an increase in candle powers of from 500 to 600 per cent over the average run of lamps of this kind.

The Central Electric Company had 40 and 60-watt tungsten lamps on exhibition.

ELECTRIC COOKING AND HEATING.

The Simplex Electric Heating Company showed a new quick-heating tea kettle in which the heating element is incorporated with the bottom of the kettle. A 10-gal. water boiler for connection to a piping system was also among the newer heating devices. A complete line of new chafing dishes of new design with copper finish were shown. A 250-watt food warmer, 10 x 14 in., was another new addition to this company's heating line.

The General Electric Company has brought out recently a number of new heating appliances which make its line of this class of goods more complete. The luminous radiator has been adapted to an ornamental grate with a pressed brass back, so arranged that, while the effect of a grate is obtained, all of the heated air is thrown out into the room and is not allowed to escape up the chimney. An improvement which will be welcome to the many central-station companies and users which have had trouble with flatiron cord terminals is the new spring contact flatiron cord terminal, which insures a better electrical contact and provides better for unavoidable inaccuracies of manufacture than did the former type, which had rigid plug receptacles. The new receptacles, which fit over the regular standard cartridge terminals of the iron, are so provided with springs as to allow for wear and for variations in manufacture. An improvement recently made in the oven is to use flat heating units in top and bottom similar to the quartz enameled units used in the water boilers and similar utensils. The oven bakes more rapidly than the former type. A combination cereal and vegetable cooker and steamer which has before been made in 2-qt. sizes was also shown in the new 4 and 6-qt. sizes. A chafing dish table is now sold in connection with heating appliances. This is a small, finely-finished table for dining room use, provided with two receptacles and push flush switches. The heavy aluminum glue pot which the company now makes is meeting with much success, as it is of high efficiency, the makers claiming that only one-sixth of the wattage necessary for the ordinary electric glue pot is needed for this. The large radiating surface automatically protects it against overheating the glue, so that a double pot with water jacket is not needed. The company is sending out 25,000 circular letters to glue pot users all over the country, in the hope of assisting local central-station companies in the introduction of this glue pot. Other new heating devices were tea kettles of 2 and 4-qt. sizes, a corn-popper, and a shaving cup in which the cup proper is white enamel. Tailors' irons of 12, 15, 18 and 24 lbs. were also among the new devices shown.

The Geen Electrical Manufacturing Company exhibited a line of electrical novelties, which included the "Never Fail Cigar Lighter." This device consists of an alcohol lamp which is lighted by a wire heated sufficiently for the purpose by a small battery.

HAIR DRIERS.

A notable thing about the hair drier exhibits was the increasing number of small portable hand devices suitable for general popular use wherever current is available.

The Shelton Electric Company, Chicago, showed a new 2¾-lb. hand motor drier, with a 20-watt fan motor blowing air through a short pipe containing a 180-watt heating coil. The motor is the same as used on the Shelton hand motor vibrators. The fan blower is of the centrifugal type. A three-point switch is mounted on the motor.

In the bathroom of the house of the Commonwealth Edison Company hair driers made by Halliwell, 109 East Twelfth street, New York, and M. Thome, of Chicago, were shown. Both these driers employ large fans placed in a box on a pedestal or stand. Among the small driers in the same house were the Shelton and the Arnold, both using small hand motors operating tiny fans.

The C. F. Birtman Company exhibited an electric hair drier, which consists of a small motor-driven fan, which discharges the air through a tube containing an electric heater. The device is mounted on a pedestal, and the tube may be adjusted to different heights and positions. The hair drier consumes 220 watts and it is said will dry the heaviest head of hair in from 5 to 10 minutes.

VACUUM AND COMPRESSED AIR CLEANING.

A self-contained electric renovator was exhibited by the Illinois Electric Renovator Sales Company. The device consists of a motor and fan together with a dust receptacle mounted on a small truck provided with a handle similar to that of the lawn mower. The plant is built largely of aluminum and weighs about 100 lbs. Mounted in a suction case at the front is a motor-driven brush, which acts similar to a carpet sweeper except that the suction of the air assists in cleaning the floor and also draws dirt and dust away from the brush. The heavy dirt is dropped into a box. The finer particles are carried through a screen and into a dust receptacle. The two centrifugal fans are driven by a half horse-power motor at 350 revolutions a minute. The device is provided with a hose connection, to which different cleaning attachments may be connected through hose.

The General Compressed Air & Vacuum Machinery Company made a large exhibit of motor-driven vacuum and combination vacuum and compressed air house and carpet cleaning outfits. The smallest shown was equipped with a 5-hp motor.

The Chicago Pneumatic Tool Company exhibited a vacuum cleaning and scrubbing machine for use in homes. The entire plant is contained in a box about 2 ft. 6 ins. high, 2 ft. 6 ins. long and about 15 ins. wide. The box is mounted on a small truck. The vacuum is produced by motor-driven bellows. Current is taken from any lamp socket, as the consumption is only about 200 watts. The device draws in about 25 cu. ft. of air per minute with a 3-in. vacuum. In scrubbing a floor soap is forced down through the brush and the suds and dirt is sucked into a tank in the machine.

Wallace Brothers, 110 Indiana Street, Chicago, had on exhibition in the "House Electrical" a portable vacuum cleaning apparatus, equipped with a 1-hp alternating-current motor. This apparatus is sufficiently portable so that it can be moved from one room to another in a house and upper floors can be reached by extra lengths of hose. The amount of current required is small enough so that no elaborate provisions have to be made for current supply, and it is, therefore, valuable not only to those who wish to purchase such a device and make it a permanent part of the house equipment, but to those who would make a business of house-to-house cleaning among customers having electric light service.

INSTRUMENTS AND METERS.

The Wagner Electric Manufacturing Company had on exhibition a complete line of its re-designed alternating-current and direct-current instruments. The new instruments have cases more suited to present day requirements. Among the instruments shown was the new type B illuminated dial switchboard voltmeters and ammeters, which are mounted on the front of the switchboard.

A pocket instrument shown by the Jewell Electric Instrument Company weighs three pounds and measures approximately 3½ ins. x 5 ins. x 1½ ins. x 1¼ ins. It is built with an aluminum case. Each instrument is provided with a leather carrying case, similar to a camera case. It has two scales for voltage readings and one for amperes. The movement is of the D'Arsonval type. The scale is uniformly divided and is 5 ins. long. The 150-volt instruments of the Jewell type have an internal resistance of 20,000 ohms. The company also exhibited a new

type of illuminated dial instrument. The Jewell company also showed its new line of alternating-current "baby" instruments. These instruments are of the round type with cases 6 ins. in diameter and are dead beat. They consume approximately three watts. There was also shown a four-reading laboratory instrument for both alternating and direct current.

The Universal Manufacturing Company, which makes flat rate controllers for taking the place of meters with flat rate electric lighting customers, has made important improvements

FIG. 2.—GENERAL VIEW FROM SOUTHEAST.

in these devices the past year. The controller consists of a switch which is made to periodically interrupt the circuit when the maximum load contracted for is exceeded. The latest controllers have no springs and instead of a flat contact gravity switch a regular knife switch with spring contacts has been substituted.

The Fort Wayne Electric Company exhibited a meter testing device which is a master meter connected in multiple with the meter to be tested. The watts passing through the instrument in a given time are determined by counting the revolutions of a dial and multiplying by a constant. The device was recently described in the Electrical World.

The H. W. Johns-Manville Company exhibited some new types of the Victor electric meter which reads in volts, amperes and kilowatts, or horse-power. This meter is already well known as consisting of a voltmeter and an ammeter, each with a dial, but with pointers crossed so that the point of crossing indicates the kilowatts. A new inspector's meter of this type was shown which, by the use of easily inserted shunts, can be used on any current up to 750 amperes.

The Bristol Company showed for the first time a complete set of portable Bristol recording instruments. With the ordineary type of Bristol recording instruments for electrical measurements of temperatures and pressures, users are already very familiar. There has been an increasing demand, however, for portable instruments which could be carried from place to place and left temporarily for record purposes at different points on an electric distribution system. The portable instruments are furnished complete with ink and chart holders in a carrying case. The movable coil which actuates the pointer is locked to prevent injury while the instrument is being carried.

Duncan meters with several improvements were exhibited by the Western Electric Company.

The Electric Appliance Company exhibited several types of Sangamo meters. Both alternating and direct-current meters were shown. All were provided with glass covers so that the working parts could be observed.

AUTOMATIC AND TIME SWITCHES.

A time switch without clockwork or clock was a novelty brought out by the Universal Manufacturing Company, of Chicago. Details of the mechanism were not yet given out, but it was stated that it could be set so as to operate either at a given hour or at a different time every day for a week.

The Albert & J. M. Anderson Manufacturing Company exhibited the improved Anderson time switch.

The Electric Manufacturing Company exhibited the M. & R. high potential cut-out, which is installed near the point at which the service wires enter the building. The switch is so designed that when a potential 100 volts higher than that of the service is thrown on the circuit the switch is opened. The device is intended to protect low potential circuits from damage due to crosses with high potential circuits or due to leakage from such circuits.

LINE AND CONDUIT CONSTRUCTION MATERIAL.

The United States Conduit and Construction Company exhibited a new multiple conduit. The conduit is made of concrete in short sections, the sections being split at the horizontal diameter of the opening. The sections interlock both ways. All exterior joints are laid up with mortar, and two or more sections when laid form a complete self-contained conduit. The construction insures alignment, and if desired the cables may be installed as the conduit is led.

The McRoy Clay Works exhibited its standard line of underground conduit. Six, four, three and two-duct conduits with bends were shown.

The American Conduit Company had on exhibit samples of its bituminized fiber conduit and illustrations of the proper method of installing the same. The company also demonstrated the adaptability of its products for other uses in the electrical industry.

Included in the very complete exhibit of lineman's tools made by Mathias Klein & Sons was a new device known as the "Chicago grip." This grip is so designed that the wire may be passed through it without bending, and holding power of the grip, it is claimed, is increased considerably by the design.

The H. W. Johns-Manville Company exhibited a new manhole cut-out box for enclosed fuses on 2500-volt circuits. Iron case service fuse boxes for 250 to 600 volts were shown with a new arrangement for filling fuses, which is an improvement on the former claw arrangement. By this one or all of the fuses in the box can be reached when the box is open. There is also a device for preventing fuses from being left with improper contact between the blades and fuse.

B. S. Barnard & Company exhibited a complete line of underground vitrified clay conduits, embracing every type known in

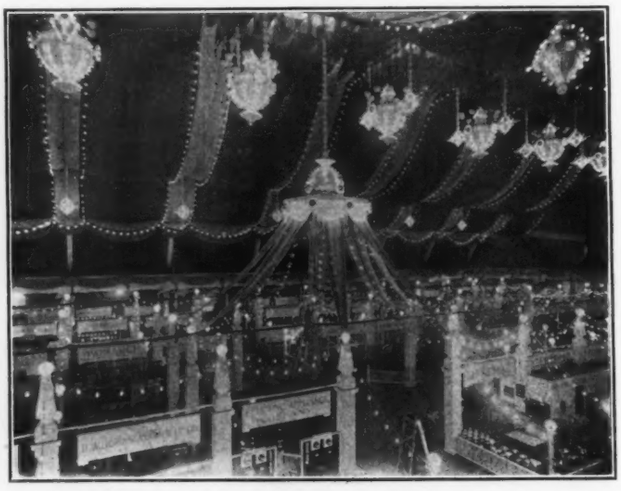


FIG. 3.—CENTRAL CANOPY.

the trade. Mr. E. F. Kirkpatrick, who recently became vice-president of this company, with headquarters in Chicago, represented his firm at the exposition.

H. B. Camp had an exhibit of underground tile conduit ranging in size from nine duct to single duct. A tile cable support for railway feeders was also shown.

The Vote-Berger Company exhibited the D. & T. (drive and

twist) guy anchors. The anchor, after being driven to the required depth, is twisted to spread the blades on the lower end.

ELECTRIC SIGNS.

The Solar Electric Company exhibited canteen signs, which consist of globes made in the shape of army canteens, in which the lamps are placed. The letters are on the globes in translucent colors. Color caps for incandescent globes were also shown.

The Federal Electric Company had a very large exhibit of electric signs of its regular enameled steel construction, with federal receptacles.

MOTOR-DRIVEN HAND AND MACHINE TOOLS.

The McDowell-Stocker Company exhibited several types of motor-driven machine tools. Included in the exhibit were two types of engine lathes, punch press, rivet-spinning machine and shaper. Motors are mounted directly on the machines. The motor for the rivet-spinning machine is of the vertical type and is connected direct to the spindle. The shaper was driven by a Lincoln variable speed motor.

The Chicago Pneumatic Tool Company exhibited a machine for driving screw spikes in railroad construction. The machine is built similar in many ways to the electric drills put out by the company, but with a socket at the end of the shaft for receiving the spike head. A magnet switch is supplied, which breaks the circuit when the spike is driven home. The company also exhibited a new line of large size drills. These are built for alternating current for drilling 2-in. holes and in direct current type for 3-in. holes.

MOTOR CONTROLLERS.

Erwin & Co. exhibited an automatic starting switch, which is used in connection with pumping systems for supplying high buildings. The water is stored in an automatic pressure tank in the basement, and the motor-operated pump forces the water directly into the tank. The switch is pneumatically operated and is set for maximum and minimum pressures.

The American Electric Fuse Company presented the Allen-Bradley controller. The resistance is of a new type, consisting of columns of graphite discs. These, however, are not made of plain graphite, but of a special mixture. The company claims for these controllers an extremely fine regulation and great durability. They are made in sizes from 3½ to 50 hp. Parts are interchangeable and all visible, and the condition of the mechanism can be ascertained at a glance. The company also produces a line of motor starters and battery charging rheostats based on the same principles.

The Wagner Electric Manufacturing Company exhibited a new type of induction motor starters for polyphase motors. The switching device is in an entirely separate case from the auto transformer part of the starter and it is so arranged that the running fuses are cut out for starting, or separate starting fuses may be provided.

ARC LAMPS.

American-made Q-I flaming arc lamps were shown by the Central Electric Company. The operating parts of this lamp are of a very compact design and solidly connected together, so that they can be instantly removed and the whole mechanism replaced without taking the whole lamp back to the shop.

Felix Hamburger exhibited the Siemens flaming arc lamps and also a new electric flashlight, "System Schmidt," a German product, in the booth of the Monarch Electric & Wire Company, with whom he occupied the booth jointly. The flashlight proved the drawing card of the exhibit. It is intended to take the place of the commonly used powder flashlights for photographic purposes, thereby doing away with the obnoxious features of smoke, smell and the danger of explosion, besides eliminating the services of an assistant. It consists of a couple of arcs in series, with a pneumatically controlled rheostat, which allows a momentary current of about 30 amperes to pass when a bulb is pressed.

STORAGE BATTERY APPLIANCES.

A signalling hydrometer with other appliances necessary to make its operation reliable was shown for the first time by the Electric Storage Battery Company. This hydrometer placed in the liquid has a compensating feature incorporated in it whereby the indications of the hydrometer are corrected for temperature. The hydrometer is connected mechanically with a relay in a glass case on top of the pilot cell. Whenever the specific gravity falls above or below certain limits this relay makes contact and rings a signal bell to warn the battery attendant. The relay can be adjusted to make contact at any specific gravity desired. Another feature necessary to make the signalling hydrometer a success is an automatic cell-filling device which keeps a constant level of the electrolyte in the cell. A glass tank of electrolyte is placed at a higher level than the cell and has a glass drip nozzle, which allows electrolyte to drip into the cell, except when a float closes the nozzle by pressing a piece of rubber upward against it. With the combination of signalling hydrometer with the compensating feature and the automatic cell filler, the signalling hydrometer can be made to give very reliable records. In addition to being made signalling, it may be made recording, so that the voltage of the cell can be continuously recorded on a piece of paper fastened on a drum.

A device for charging small storage batteries was exhibited by the Vivax Storage Battery Company. The generator, which has a capacity for 3½ amperes when attached to the running gear of an automobile and connected to the batteries, eliminates the necessity of removing the batteries for charging.

The Vivax Storage Battery Company also exhibited a small portable storage battery connected to a bracket lamp adapted for use in houses not wired for electricity. One battery shown had a capacity of 175 amperes at 6 volts.

WIRES AND CABLES.

The American Electric Fuse Company put on exhibition samples of its new black enameled wire, which it recommends in place of silk covered magnet wire. The company claims that the enameled wire is considerably cheaper and its insulation better than silk. When wound on a coil it will stand more current and will not char from heat, as does silk. The enamel is tough, elastic and continuous, not affected by water and insoluable in solvents, such as petroleum, alcohol, benzine, turpentine, etc.

The American Steel & Wire Company presented a very attractive exhibit, with a number of new features. Among these was a submarine power cable for 25,000 volts. Worthy of attention was a new type of a crown rail bond, for which this company claims specially good conductivity and long life, by reason of an exceptional solid union between the crown and the conducting portion. An electrically operated rail bonding tool was shown, in addition to the above-mentioned features.

The Duplex Metals Company exhibited Monnot copper clad products, consisting of a mechanically welded surface of copper or steel wire for telegraph or telephone work and power transmission.

Included in the exhibit of John A. Roebling's Sons Company, which consisted of the company's standard line of bare and insulated wire and cables, was some extremely small wire, one thousandth of an inch in diameter. One ounce of this wire has the length of four miles.

INSULATING MATERIALS.

The H. W. Johns-Manville Company, in addition to its asbestos lamp and transite board, had on exhibition a new product called asbestos ebony wood. This is asbestos impregnated with a black compound, which will allow it to take high polish and prevent absorption of moisture. Tests were shown giving a very low percentage of moisture absorption for this material. It will not, of course, stand the high temperatures that unimpregnated asbestos compounds will, which will absorb a larger percentage of moisture.

Some interesting insulators made for recent high tension railway and tunnel installation by the Electros Manufacturing Company were exhibited by F. W. Pardee, general sales agent at Chicago.

A. Grothwell exhibited Mogul insulating paints and varnishes, including armature varnishes, acid and alkali proof compounds, electrical compound and boiler and stack paints.

FAN MOTORS.

The Robbins & Myers Company, of Springfield, Ohio, brought out a new 9-in. fan for direct and alternating current circuits. This fan meets the demand for a fan motor of low wattage for use in residences and in small offices where the 12-in. fan is larger and more vigorous than necessary. The motor used is a small commutator type motor both for direct and alternating current. The workmanship of the fan is equal to that on any of the larger fans, but, being of small size, it is possible to make the price low enough to insure its popularity. The motor has bronze bearing sleeves and wick oilers. The base is provided with a starting and stopping switch and a rheostat giving two speeds, approximately 1000 r. p. m. and 1700 r. p. m. At the slower speed the fan is practicaliy silent. The weight complete is only 7 lbs., so that it is much more portable than larger types of fans. This company's oscillating fans are now made for both alternating and direct current. The oscillating feature greatly increases the cooling efficiency of the fan, because it can cool a much larger area than can be covered by a fixed fan. These oscillating fans are made in 12-in. and 16-in. sizes.

Dr. G. W. Haverstick exhibited "ocean breeze" fans. An electric fan of the ordinary type is placed behind a cylinder approximately 3 ft. long. An extension from the shaft of the motor operates an additional fan at the further end of the cylinder. The inside of the cylinder is provided with small open tubes, which are kept filled with water by a water spray. Water also fills the bottom of the cylinder. The air, in passing through the spray and over the water in the tubes, is delivered pure and fresh into the room. It is claimed that the temperature of a room may be quickly reduced to approximately that of the temperature of the water. The water is supplied to the cylinder from a hydrant through a small tube contained in a larger one, which serves as a discharge and overflow.

INTERIOR WIRING AND CONSTRUCTION.

Under this head are included devices of interest to the interior wiring contractor and engineer.

A new current tap exhibited by the Benjamin Electric Manufacturing Company has a rotating sleeve, which makes it unnecessary to turn the device to which the cord is attached when screwing the plug into the socket. The cord can be led out at any angle, and the tap may be fixed in any position. The tap has a well-protected porcelain base, and it may be obtained with any finish desired.

The Manhattan Electrical Supply Company exhibited a floor tread for use in the dining room or vestibule for operating an electric bell. The tread may be placed under the rug, and the circuit is closed by a slight pressure with the foot at any point. The bottom is covered with felt to protect a polished hardwood floor. The company also exhibited a combined socket and attachment plug for tapping current from a light fixture to operate a fan motor, drop light, flatiron or other electrical device without disturbing the light from the lamp remaining in the socket. The Mesco separable attachment plug, which is so designed that it will separate at any angle and without damage to the socket or cord was also shown. It is built with spring contact clips of gun metal bronze.

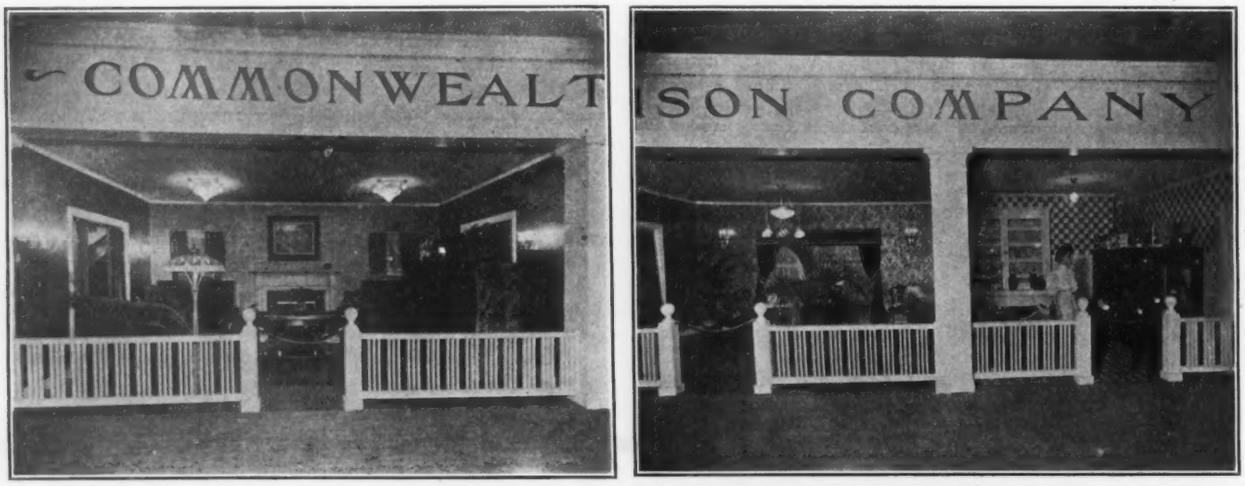
The Spaulding-Bates Company exhibited the Bates globe cleaner and adjuster. This is a device for cleaning and removing lamps placed at a height which would otherwise be accessible only by the use of a ladder. A lamp holder is fitted to a long rod, and the lamp is unscrewed or screwed into the socket by turning a handle at the lower end of the rod. The lamp is cleaned by placing cloth washers in the holder, then revolving it by means of the crank. The device is built to reach ceilings 20 ft. high or higher.

FIG. 6.—KITCHEN; COMMONWEALTH COMPANY'S EXHIBIT.

W. N. Matthews & Bro. exhibited several new designs of "hold fast" lamp guards. The new types are made of stronger and heavier wire and with clips across the ribs. The guards are also made longer, so as better to protect the end of the lamp.

The Chicago Fuse Wire and Manufacturing Company exhibited its standard line of enclosed fuses and blocks, fuse wire and links, union outlet boxes and conduit boxes.

Arthur O. Einstein exhibited for the Pratt Chuck Company a new line of galvanized conduit junction boxes. Special merits are claimed for these boxes in that they are galvanized instead of enameled, like other boxes on the market. The covers for the same can be put on and removed without taking out the screws, which feature represents a saving to the contractor, and is patented.



FIGS. 4 AND 5.—LIVING ROOM, DINING ROOM AND PANTRY; COMMONWEALTH COMPANY'S EXHIBIT.

The new Benjamin separable wireless cluster, described in the Jan. 4 issue of the ELECTRICAL WORLD, was exhibited by the Benjamin Electric Manufacturing Company. The cluster consists of two principal parts, separably connected. The separate base may be installed and the cluster proper screwed in position afterwards. When it is desired to clean the glassware or reflectors these may be removed without disturbing the wire or connections by simply unscrewing the cluster proper.

The Gillette-Vibber outlet boxes for use on moulding as well as the type caps and ground clamps of the same company were exhibited by M. B. Austin & Co.

A new attachment plug exhibited by the Benjamin Electric Manufacturing Company has a rotating sleeve which obviates twisting the cord. The plug is unusually small, neat in appearance, and there are no detachable parts to become lost or broken.

The Sterling flexible steel conduit and Thomas & Betts bushings and boxes were exhibited by M. B. Austin & Co.

The Appleton Electric Company made a special display of "unilets," which are outlet boxes not employing metal bushings or lock nuts.

The J. Lang Electric Company had the McWilliams metering panel board mounted in a cabinet containing also a bank of meters and showing how this new panel board can make it possible to connect any desired combination of circuits to a meter, as in a large office or flat building, where a number of meters are located at one point. The large number of connections on this new metering panel board is accomplished by the removal or insertion of screw plugs. In this way the usual mess of meter wires is done away with. This company also showed its universal panel boards.

FIXTURES AND DECORATIVE GLASSWARE.

The Federal couch bracket shown by the Federal Electric Company is a new, handsome design of electric portable lamp employing a half shade. This bracket is adapted also to use as an upright, after the manner of a candlestick, in which case it can be equipped with a silk shade. It can also be used as a piano lamp or as a portable wall bracket hung on the wall.

The Colonial Art Glass Company, of Chicago, had a magnificent display of art glass designs in domes of various sorts, box fixtures and table lamps, the design of C. E. Parkhurst. Besides the shades actually on exhibition, illustrations of various other handsome designs were shown.

A porcelain enameled steel ceiling fixture for porch use was shown by the Federal Electric Company.

The Phœnix Glass Company exhibited some of its new designs in plain and colored glass shades and reflectors.

VIBRATORS.

Vibrator exhibits were noticeably numerous.

The Shelton Electric Company showed, besides its regular line, a new vibrator operated by a flexible shaft from a motor mounted on a table or pedestal. The motor is of the same design as those used on Shelton hand motor vibrators, being a commutating motor for operation on direct or alternating current.

The Moon Vibrator Company exhibited vibrators for use on direct or alternating current or for operation from a portable battery. A standing offer is made by this company to give any responsible party two weeks' free trial. The retail price of the vibrator to operate from electric lighting circuits is $15, the machine being intended for popular use.

The Swedish Electric Vibrator Company had an exhibit showing hand vibrators and a vibrating chair.

The Manhattan Electrical Supply Company exhibited the Morrison vibrator, which consists of a motor, on the shaft of which is a disc which may be set off-center, varying distances to increase or decrease the amplitude of the vibration. The vibrator is intended for either direct or alternating current and is also furnished with dry batteries for use where other current is not available.

The C. F. Birtman Company exhibited a pedestal vibrator of the eccentric type. The vibrator is made either in portable form or is mounted on a pedestal.

The Lindstrom, Smith Company showed a vibrator consisting of a motor entirely enclosed in a shell. An attachment is supplied with the vibrator for securing it to a chair.

MOTORS.

Roth Brothers showed several sizes of their new type S motors. These are of steel and are built very compact. The pole pieces are laminated.

ELECTRIC CLOCKS.

The United Clock Company showed a new mantel clock built without a pendulum and on the principle of a watch. The clock will run a year or more without attention, being automatically operated by dry batteries. The clock is built in Gothic style with mahogany finish and sells for $30.

The company also showed a new line of synchronous clocks operated through wires from a master clock.

The American Clock Company exhibited a new electric time recorder. It automatically changes each minute and the impression shows the exact time to the minute that an employee enters or leaves. The recorder is entirely separate from the clock and connected with it by a flexible cord or wire, so that the operation of the recorder does not in any way affect the clock. Any number of recorders may be connected to the same clock, thereby insuring uniform and accurate timekeeping throughout the system. This company also exhibited a new electric clock especially designed for street and advertising purposes. It also exhibited a regular line of electric time stamps, secondary clocks and self-winding clocks.

DEVICES FOR DEFECTIVE HEARING.

The International Telephone Manufacturing Company exhibited its recently evolved "Auricuraphone" for the use of people with defective hearing. The device consists of an extremely sensitive transmitter, made up in convenient form of such a size that it can be carried by men in the vest pocket or under a lady's jacket. A small receiver connected to the transmitter is held to the ear. The transmitter takes up conversation in an ordinary tone at as great a distance as a good ear will receive it and the sound is amplified in transmitting so as to compensate for the defective hearing.

The Stolz Electrophone Company exhibited a device to assist those with defective hearing. The electrophone consists of two parts—a transmitter and an ear piece, with a total weight of 12 ounces. The transmitter contains the batteries and fits into the average vest pocket. The electrophone, it is said, differs from other electrical hearing devices on the market in that it is an amplifier of articulation as well as a sound amplifier.

TELEPHONE EXHIBITS.

A new party line telephone known as the harmonic telephone was demonstrated by the Stromberg-Carlson Telephone Manufacturing Company. With this system four to eight parties may be connected on the same circuit and any one of the parties may be called selectively.

A new automatic push-button telephone was shown by the Stromberg-Carlson Telephone Company for the first time.

An eight-way Hargis splicing joint was exhibited by W. N. Matthews and Brother. This joint is intended for use at points where the wires of a trunk cable are distributed through smaller cables in various directions.

A new wall telephone shown by the Swedish American Telephone Company has the dry batteries installed in the hinged door carrying the transmitter.

The Monarch Telephone Manufacturing Company showed several new designs of desk telephones having separate boxes for the batteries.

The International Telephone Manufacturing Company made a special feature of a loud-speaking telephone equipment. By the use of an equipment the grand opera at the International Theater was transmitted over the line of the Chicago Telephone Company to the booth and thrown out through a megaphone. There was also exhibited a "telephograph" for transmitting phonograph music over long distance lines.

The Swedish American Telephone Company exhibited a coil

removable drop. The coil may be removed with the shutter attached by simply raising a spring with the finger. When the coil is removed calls are not interfered with as they come in on the clearing out drop.

The Vote-Berger Company had in operation a section of a 32000 line multiple ballast common battery switchboard complete, with power plant, storage battery and harmonic ringing telephones. The board was without relay ballast, lamps being used to take up overload.

The Monarch Telephone Manufacturing Company had on exhibition a complete four-party, direct-current, selective telephone system. The system operates without the use of a ringing machine. Instead of the usual machine, a 50-cell dry battery is installed at the exchange. The system is similar to the old pulsating system, except for the substitution of the battery for the ringing machine. The company also exhibited, for the first time, a new line of common battery equipment, including release jacks and keys.

The Automatic Electric Company exhibited in a very complete manner its automatic telephone system.

A new plug restoring drop type board was exhibited by the Stromberg-Carlson Telephone Manufacturing Company.

S. H. Couch & Company exhibited a complete line of their apparatus for interior communication.

Frank B. Cook displayed a complete line of his well-known protective appliances for outside as well as inside purposes. Conspicuous was a new form of central office protecting apparatus; also a line of self-welding wire joints.

The American Automatic Telephone Company had on exhibit one section of a 5000-line automatic exchange board, with banks and multiples. A model central energy automatic exchange, with 'phones, both direct and party lines, was shown in operation. It also exhibited a new line of telephone instruments for wall and desk, as well as a new harmonic ringer. The company uses a two-wire system, with a full metallic circuit, omitting ground in connection with calling.

MISCELLANEOUS.

The C. F. Birtman Company exhibited an electric manicuring set. This consists of a tool, head driven through a flexible shaft by an electric motor. The head is designed to be fitted with saws and other tools for buffing and polishing the nails.

The Ozone Company of America, 141 South Clinton street, Chicago, showed a set of apparatus for purifying water for offices, schools and factories by ozone treatment. It also showed an air-purifying apparatus. In both these types of apparatus a small fan motor is used for securing the necessary air circulation, the air being then treated by the electrical discharge from a high-tension coil.

The Excelsior Supply Company exhibited the Dow Comet Magneto, which is of the high-tension type and which eliminates the necessity of batteries or coils when used with gas engines.

The Joseph Dixon Company exhibited its standard line of motor brushes, crucibles, resistance rods, lubricants and other graphite specialties.

The Studebaker Manufacturing Company exhibited its newer types of electric automobiles, together with a mercury arc rectifier connected for charging the vehicles.

The Nungesser Electric Battery Company exhibited dry batteries, including the "1900" battery and pocket batteries.

F. W. Pardee, of Chicago, showed the Rock Island dry cells.

The exhibit of the Crane Company proved of great interest to those connected with the design or operation of central stations by affording them an opportunity to inspect the latest improvements in valves and steam specialties, especially for high pressures. They found there exhibited a new line of valves and fittings for superheated steam made of cast steel. The seats and stems of the valves are made of pure nickel. The company claims that neither the body nor the trimmings of its steel valves are affected by excessive temperatures. The purely electrical feature of the exhibit was a gate valve operated by a motor attached directly to the stem. The motor is stopped automatically when the opening or closing movement is completed.

F. D. Pearne exhibited a typewriting telegraph outfit. The transmitter consists of an instrument provided with an ordinary typewriter keyboard. This is connected with the receiving device by a line wire and possibly a ground wire. The receiving device consists essentially of a motor driven typewriter, and messages are written automatically on the machine. The connections between the transmitting device and the receiver are similar to those of a quadruplex telegraph system. A polarized line relay is employed.

The Radio-Telephone Company exhibited a combination wireless telephone and telegraph set. Receiving and transmitting stations were installed, one in the company's booth in the main floor and another in the gallery of the building. The device was described in recent issues of the technical press and is identical with that in service on Admiral Evans' fleet, which is now on its way to the Pacific Ocean.

The Wagner Electric Manufacturing Company exhibited its new type of transformer, known as "the high efficiency and standard lighting" type. These transformers are of the shell type and have several new features in the design and the arrangement of the iron and the coils.

The Kellogg Switchboard and Supply Company exhibited a railway telephone of new design. The instrument is housed in a strong box of malleable iron, which when the door is closed effectually protects it from the weather. The telephone proper may be removed from the box and used as a portable instrument.

In the exhibit of the Kellogg Switchboard & Supply Company one of its new No. 25 condensers was placed across a motor-operated switch, which broke continuously a current of 5 amps at 220 volts. The presence of the condenser practically eliminated the spark. The condenser is built to withstand 1000 volts and has an insulation resistance of 100 megohms. Its capacity is 2½ microfarads.

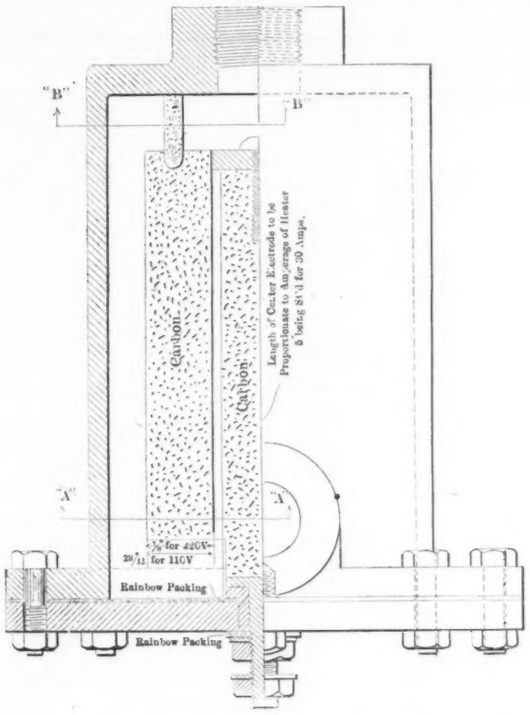
The Kellogg Switchboard and Supply Company exhibited an oscillograph used in the design of its telephones to investigate the four-party harmonic system, voice currents, transmitters and receivers and other telephone parts.

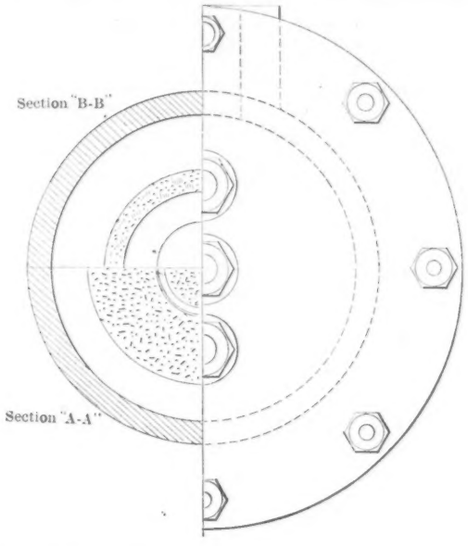
Instantaneous Water Heater at St. Louis.

The Union Electric Light & Power Company, of St. Louis, has recently installed for a number of its customers, and also in its model apartments in its salesrooms, a new type of electric water heater which is stated by the company to have given excellent satisfaction. This heater is the invention of Dr. Harry Hill, of St. Louis, and differs from other hot-water heaters in which the current flows through a solid resistance material such as wire. In the Hill heater the current flows directly through the water to be heated, from one carbon electrode to another. In a cast-iron shell are placed two carbon electrodes, as shown in the sectional drawing, Fig. 1. One is a hollow cylinder and the other is a solid plug of carbon. The solid electrode is inserted into the cylinder with an intervening gap of ⅛ to 3/32 inch around, and through which flows the water drawn from the mains. The water acts as a resistor, and thus takes up the heat units directly. An efficiency of 99 per cent is claimed. The wiring connections are made to terminals extending through the bottom plate of the casing or casting, both, of course, being well insulated from the case and connected to their respective carbon electrodes. The plumbing connections consist simply of the intake or supply pipe at the base of the shell. The water flows out through a connection at the top of the shell.

When the heater is applied directly to a bathtub, wash-basin or sink, as in Fig. 2, a Fuller hopper is used in connection with a faucet handle, which handle is connected by a stem to an ordinary snap switch, the internal mechanism of the switch being charged to make a sliding contact. The same stem opens and closes the Fuller cock, and simultaneously opens and closes the circuit. Thus, no energy is used when the water is turned off, but turning on the water closes the circuit. When applied to a house tank, where the supply of hot water is, of course, stored in the tank, the automatic switch is not used, but the

meter can be controlled by a switch placed in the kitchen or bathroom, or any other convenienet place in the house. The same plumbing connections are made to the tank as in the case of ordinary gas or coal heater. At St. Louis these





FIGS. 1 AND 2.—SECTION OF ELECTRIC METER HEATER.

heaters in 440, 660 and 1100-watt sizes have been connected to an ordinary hot-water radiator, the radiator being filled with water and the energy supply obtained from the ordinary lighting circuit. The heater in this case serves as an efficient form of room-heater, the radiator, on account of its large radiating surface, giving, it is claimed, superior heating results to an electric air heater of the same wattage. In this case, the radiator is furnished with a small cup at the top to provide for the expansion of the water. It would, of course, be possible to connect a large electric heater of this kind to the hot-water heating system of a house as a substitute for the hot-water heaters requiring coal as fuel. In fact, this has been done in the case of some electric railway cars in St. Louis piped for hot-water heating.

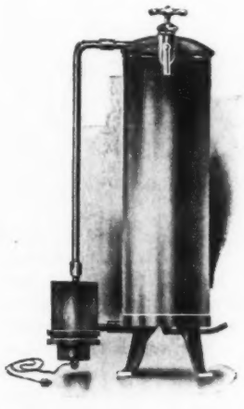


FIG. 3.—HILL HEATER ON HOUSE TANK.

It is claimed that the water passed through this heater has all germ life within it destroyed, and hence that it acts as a purifier as well as a heater. Tests made by Dr. R. B. H. Gradwohl, professor of bacteriology in the Marion-Simms-Beaumont College of Medicine, St. Louis, Mo., are reported as follows: It was found that in the tap water drawn from the city mains at a temperature of 70 degs. F., which had not passed through the heater, there were 15,400 bacteria to the cubic centimeter. Water taken from the heater at 190 degs. F., showed eight bacteria to the cubic centimeter. The tests showed a gradually increasing number of bacteria as the temperature of the water drawn from the heater was lowered, until when the water drawn was at 120 degs. F., 125 bacteria to the cubic centimeter were found. A test made by the same authority at another time showed 8600 bacteria to the cubic centimeter in the unheated water, and only two, three and four bacteria after passing through the heater. Dr. Carl Fish found the city tap water to have 8000 bacteria to the cubic centimeter, 97 per cent of which were destroyed by passing through the heater. The inventor states that the resistance of water used by various communities varies so little that a heater built on this plan is practically suited for all city water. The heater is made in various sizes, the largest being for 20 amperes at 220 volts for house-tank heating purposes, and the smallest for 4 amperes at 110 volts for faucet use. The Union Electric Light & Power Company has the St. Louis rights for the heater. It is controlled by the Hill Electrical Manufacturing Company, 402 Century Building, St. Louis, Mo.

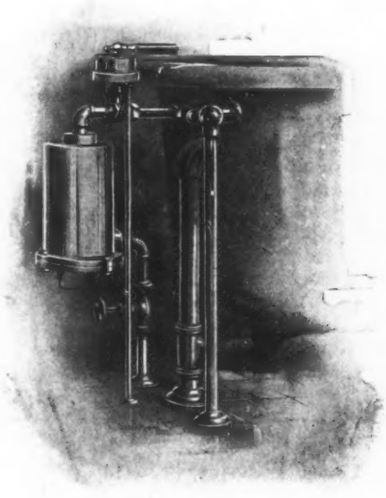


FIG. 4.—HILL HEATER ON BATH TUB.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.—A survey of the financial, commercial and industrial situations indicates improvement along conservative lines, although it is probable that a relatively smaller volume of spring trade will be done. A further easing off in the financial situation and very general reports of improvement in collections were the leading features of the week. In trade lines colder weather and snow helped retail distribution somewhat, and wholesalers and jobbers report sentiment improved. The trade demands, however, are still below the normal. One of the best features of the week was the broader market for commercial paper. Buyers are coming into the leading markets in large numbers. Manufacturers are increasing production gradually, conservatism being general, but many industries are not operating more than fifty per cent of their full capacity. Readjustment of wages is still contemplated by many producers before machinery will be started. Railway earnings continue to shrink, and industry is still rather inactive. More life was shown in the pig-iron markets, the principal demand coming from makers of cast-iron pipe. Prices are about steady. In finished lines trade did not develop to any extent, but sentiment as to future demand has improved. Business in steel rails was dull, and demand for structural material continued light. Domestic business in copper was moderately good, but the European demand dominates the situation. It is reported that something like 20,000,000 pounds of electrolytic copper have been sold within the past week for foreign account at a price equal to or better than 14c., and that recent sales have reduced stocks to a point slightly below normal. The closing prices were a little higher, Lake being quoted at 13⅞c., electrolytic 13¾c., and casting stock 13½c. Railway earnings in December, as indicated by preliminary reports, showed a decrease of 4.5 per cent from December, 1906; the preliminary reports for the full calendar year, however, indicate an increase of 7.7 per cent on identical roads. The number of business failures continues high, *Bradstreet's* reporting 431 for the week ending Jan. 16, as compared with 435 for the previous week, and 235 in the corresponding week of 1907.

SHIPMENT OF 25,000-HP ENGINE.—A visitor to the West Allis works of Allis-Chalmers Company one day last week, would have been arrested by the sight of two seventy-five ton cranes engaged in picking up, piece by piece, a million and a quarter pounds of metal, and loading the various parts on flat cars for transportation to the mills of the Carnegie Steel Company, at Sharon, Pa., where they will be reassembled into an engine of no less than 25,000-hp capacity, the largest ever installed in any country of the world. Some idea of the size of this engine may be gained from the fact that two of the castings for it weighed, after machining, 118 tons each, with other parts in proportion, requiring for their transportation the special reinforced 100-ton cars built in the Chicago, Milwaukee & St. Paul shops, at Milwaukee, for Allis-Chalmers Company. The engine, as a whole, weighs 550 tons, without foundation-plates or fly-wheel. It is a horizontal, twin-tandem rolling mill engine, with cylinders 42 in. and 70 in. x 54 in. stroke, designed to operate condensing at 175 lbs. steam pressure, and a speed of 150 to 200 r. p. m., developing its maximum power at the highest number of revolutions. Being used to operate the rolls in a steel mill, it has to be quickly reversed at the end of each run, and the load varies within a few moments from nothing to the maximum power exerted. The reversing mechanism used for changing the direction of the engine is of the Reynolds-Marshall type, and run by a small independent engine with oil cylinder lock. Another small engine is also employed in operating the steam throttle valves, all of these units being under the perfect control of the one engineer. Only a few seconds are needed for the act of reversing.

PLANT FOR RICHMOND, VA.—An Allis-Chalmers steam turbine and generator of 3250-kw capacity, on normal load, constituting the largest electric generating unit thus far installed in the State, is now being placed by the Virginia Passenger & Power Company in its Twelfth Street Station, at Richmond, Va. This unit will operate at a speed of 1800 r. p. m., and is designed to deliver three-phase, 60 cycle current at a pressure of 2300 volts. From the generator bus-bars the energy, after passing through the switchboard, will be stepped up to the transmission voltage and transformed through new 1000-kw motor generator sets located in a sub-station, whence it will be distributed over the trolley lines at the operating voltage. Under the control of the receivers, Messrs. Wm. Northrup and Henry F. Wickham, represented by the present officers of the company, of which Mr. S. W. Huff is general manager, the Virginia Passenger & Power Company has had the most prosperous period in its history; and, with the authority recently granted by the Federal Court, liberal expenditures for improvements are now being made, with the object of still further increasing the earning power of the system. Thus far the principal dependence of the company has been upon hydro-electric power derived from the river, supplemented by steam plants including five generators driven by Allis-Chalmers tandem-compound vertical engines; but the rapidly growing traffic has necessitated the purchase of this new steam turbine unit, which, with its large overload capacity, is expected to provide ample power for some time to come.

NATIONAL CONDUIT & CABLE FIRE.—Fire, starting as nearly as can be learned, from spontaneous combustion, gutted entirely the enamelled wire experimental building of the National Conduit & Cable Company, at Hastings, N. Y., last week. There were but three employees in the building, which is 50 ft. x 50 ft. and three stories high, at half-past 9 in the morning when the blaze was discovered. One of them was slightly injured in jumping from the second story to the ground. The National Conduit & Cable Company has one of the largest plants in the State, and its twenty buildings cover an area of more than a square mile. A fire wall surrounds the experimental station, and the 1000 employees in the other buildings did not leave their work while the firemen were overcoming the flames. At the offices of the company it was said that the damage done would not amount to more than $20,000, and was fully covered by insurance.

HYDRAULIC PLANT FOR CALIFORNIA.—A 9700-hp Francis type hydraulic turbine built by Allis-Chalmers Company, Milwaukee, has just been placed in regular operation at the Centerville plant of the Valley Counties Power Company, owned by the California Gas & Electric Corporation, of San Francisco. This installation is unique among hydro-electric plants, from the fact that never before has a Francis wheel been designed for the extremely high head of 550 feet. Results of early tests have shown that the high efficiencies and smooth running qualities expected have been fully realized. A governor-operated relief valve is working perfectly in the service, discharging the 190 cu. ft. of water per second, turned off suddenly from the turbine by the governor, without exceeding a pressure rise of 7½ per cent above the normal pressure in the pipe line.

GREAT FOREIGN TRADE.—December's exports of merchandise from the United States, according to the monthly statement of the Bureau of Statistics issued last week, exceeded all other monthly records, the total value being $207,170,000, compared with $190,400,000 in December a year ago. Imports of merchandise on the other hand fell to a total of $92,288,000, smaller than that of any month since August, 1905, it being the smallest December total of the past four years. The export excess for the month, $105,000,000, like the export total, also established a new monthly record. The total for the year was $1,923,498,434 of exports, and $1,423,326,680 of imports, an export excess of $500,171,754, the largest excess since 1902, and the largest total foreign trade of any year, $3,346,825,114. Our excess import of gold was only $88,182,385.

THE STERLING ELECTRIC COMPANY, of San Francisco, Cal., has been formed to take over the business of the Century-Kline Company, dealers in electrical supplies. F. M. Greenwood is president and W. S. Goodman, vice-president.

Financial Intelligence.

THE WEEK IN WALL STREET.—The stock market was irregular and showed a tendency in some parts of the list to react on the preceding sharp advances which followed the recent improvement in money conditions and the elimination of the New York bank deficit in reserve. Pool manipulation was apparent in a number of stocks, notably Reading, while New York Central recovered ground sharply on the success of the subscription for its 5 per cent equipment bonds. An important development of the week was the renewed ability to borrow money on time at less than 6 per cent, the supply of such funds being very large. Some attention was paid to statements that the steel situation is improving in respect at least to the placing of new orders, although there was a general consensus that United States Steel Corporation's showing of earnings for the December quarter will represent a marked contraction. Some attention was also paid to poor railway earnings now being reported as a result of the panic and shrinkage in business. The cutting of the Amalgamated Copper dividend had no special effect on the market. A good business was transacted in electric and traction stocks, and all these show substantial advances over the previous week's quotations. On the curb market moderate improvement was shown in sympathy with the exchange list, but no considerable outside interest was developed. Following are the closing quotations of Jan. 21:

NEW YORK.

	Jan. 14	Jan. 21		Jan. 14	Jan. 21
Allis-Chalmers Co.....	6½	6⅛	General Electric	123¼	120
Allis-Chalmers Co. pfd.	21¾	19⅛	Hudson River Tel.....	—	—
Am. Dist. Tel.....	—	—	Interborough Met. com.	7¼	7⅝
American Locomotive...	41½	38	Interborough Met. pfd..	20¾	20
Amer. Locomotive pfd..	90	91	Mackay Cos.	58	56¼
American Tel. & Cable..	—	—	Mackay Cos. pfd.....	62¾	62¼
American Tel. & Tel...	106	107	Marconi Tel.	—	—
Brooklyn Rapid Transit.	43½	44⅛	Metropolitan St. Ry...	—	—
Electric Boat	—	—	N. Y. & N. J. Tel.....	—	—
Electric Boat pfd.....	—	—	Western Union Tel.....	58	57¼
Electric Vehicle	—	—	Westinghouse com.....	50¾	48
Electric Vehicle pfd....	—	—	Westinghouse pfd.....	—	—

BOSTON.

	Jan. 14	Jan. 21		Jan. 14	Jan. 21
American Tel. & Tel...	107	108	Mass. Elec. Ry. pfd....	50*	48
Cumberland Telephone..	98	99	Mexican Telephone.....	1¼	1½
Edison Elec. Illum.....	212	209½	New England Telep....	113½	117
General Electric	—	—	Western Tel. & Tel.....	5	6
Mass. Elec. Ry.....	12	11¾	West. Tel. & Tel. pfd...	62	65

PHILADELPHIA.

	Jan. 14	Jan. 21		Jan. 14	Jan. 21
American Railways.....	43	43	Phila. Electric	6⅜	6⅜
Elec. Co. of America...	8⅝	8⅝	Phila. Rapid Transit....	17½	16
Elec. Storage Battery...	32	29	Phila. Traction	86⅝	88
Elec. Stor. Battery pfd..	—	—			

CHICAGO.

	Jan. 14	Jan. 21		Jan. 14	Jan. 21
Chicago City Ry.....	150	140*	National Carbon	50	53
Commonwealth-Edison ...	84	87	National Carbon pfd....	103	103¼
Chicago Subway	—	—	Union Traction	—	—
Chicago Tel. Co.....	118½	115	Union Traction pfd.....	—	—
Metropolitan Elec. com..	17	17			

*Asked.

THE COLUMBUS, OHIO, EDISON COMPANY has placed on the market $100,000 of 6 per cent cumulative preferred stock that has been in the treasury for some years. It is stated that the money received from this stock will be used to pay the Columbus Railway & Light Company for improvements that have been made on the plant. The stock will be sold at par to holders of common stock in proportion to the amount owned. A call has been issued for a meeting of the board of directors, when, it is said, the capital stock will be increased from $1,000,000 to $1,500,000, of which $200,000 will be 8 per cent cumulative preferred and the other $300,000 common stock. The business of the company has shown such rapid growth, it is said, that quite a large sum of money must be expended to bring it up to the capacity needed. The Columbus Railway & Light Company, which leases the plant of the lighting company, is said to have expended large sums of money in improving the property and that as soon as the stock is sold this will be repaid. The present stock has been taken rapidly, and the Cincinnati men interested have proposed to take all that is not sold to the stockholders direct. A rumor that the company would purchase the property of the Columbus Public Service Company has been denied by the officers of both corporations. The idea was that the additional money secured from the stock now being sold and that to be issued would be used in taking over the property of the competitive company. The special meeting of stockholders will be held on March 1.

CANADIAN BELL TELEPHONE.—The stockholders of the Bell Telephone Company of Canada, at a special meeting in Montreal, on Jan. 10, ratified the sale to the provincial government of the company's lines, buildings, equipment and other assests contained in the Province of Quebec. The $3,000,000 worth of 40-year 4 per cent bonds which the company will receive from the province will constitute a trust fund, which can be utilized to pay for improvements to the company's present system. C. F. Sise, president, stated that he considered the bargain a good one for the company as some important reservations were made, for instance, the Bell Company had the right to operate lines over the province connecting Saskatchewan and Ontario, and it also had the right to connect with the Manitoba Government lines on through business.

ST. LOUIS MORTGAGE.—A refunding and extension mortgage dated Dec. 1, 1907, by the Union Electric Light & Power Company, to the Bankers' Trust Company, of New York, and the Mississippi Valley Trust Company, of St. Louis, as trustee, was filed for record in the Recorder's office Thursday. The mortgage secures bonds to be issued by the Union Company from time to time, as authorized by law, the total issue not to exceed $50,000,000, to bear interest not exceeding 5 per cent. The mortgage reserves new bonds to cover all existing mortgages on the property of the company and collateral trust notes, and provides for immediate issue of $4,000,000 additional bonds for improvement. The mortgage covers all the property of the company now owned, and all it may acquire hereafter.

DIVIDENDS.—Directors of the Western Telephone & Telegraph Company have declared a regular semi-annual dividend of 2½ per cent on the preferred stock. Directors of the International Steam Pump Company have declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable Feb. 1. Directors of the Amalgamated Copper Company have declared a quarterly dividend of ½ of 1 per cent. This is a reduction comparing with 1 per cent three months ago, 2 per cent six months ago, and 1½ and ½ per cent extra a year ago. The Conestoga Telegraph & Telephone Company, Pennsylvania, has declared a dividend for the year of 5 per cent. The Twin City Rapid Transit Company has declared a quarterly dividend of 1¼ per cent on the common stock, payable Feb. 15.

ROCHESTER TELEPHONE STOCK.—An increase of the capital stock of the Rochester Telephone Company from $500,000 to $1,000,000 has been stopped by injunction. It is understood that the Buffalo Consolidated Telephone Company is the chief factor behind the injunction, although the restraining order was granted upon application of David Decrow, of Buffalo, a stockholder in the Rochester Telephone Company. This company fears that should the Bell Company secure control of the Rochester Telephone Company, which carries with it control of the Syracuse, Utica and a number of smaller operating companies, it would have complete dominance over the telephone system between Buffalo and Utica and the Buffalo corporation would be cooped up in that city.

FRENCH WESTINGHOUSE.—At Pittsburg, Jan. 16, on an order issued by United States Judge Ewing, the receivers for the Westinghouse Electric & Manufacturing Company have returned to France six checks for a total of $306,000, received from the Société Anonyme Westinghouse, the French Branch of the Westinghouse interests. Each of the six checks was for $51,000, and all were dated Oct. 22, after the concern went into the hands of the receivers, and it was for that reason that the receivers asked that they be returned.

BRITISH WESTINGHOUSE.—In the United States District Court at Pittsburg an order has been made allowing the receivers of the Westinghouse Electric & Manufacturing Company to exchange a claim of $875,000 against the British Westinghouse Electric & Manufacturing Company for shares in the Traction & Power Securities Company of Great Britain at par and interest, provided the British Westinghouse Company secures bona fide subscriptions to a bond issue of £250,000.

NORTH AMERICAN DIVIDENDS.—It is now understood that the policy of the North American Company will be not to resume dividends in the immediate future. Dividends have been earned at the rate of about 5 per cent, but in the recent financial stringency it was found better to use surplus earnings as advances to the subsidiary companies for their necessary extensions and improvements. In the long run the company will be all the stronger for the conservative methods adopted.

TWENTY PER CENT WESTINGHOUSE DIVIDEND.—The Westinghouse Brake Company, Limited, of Great Britain, has announced a dividend at the rate of 20 per cent per annum for the six months ending Dec. 31, 1907, with a bonus of 5 per cent for the year.

GENERAL NEWS

Construction News.

ENON, ARK.—The Enon Telephone Company has been organized to build rural lines in the vicinity of Enon. Thomas J. Davis is manager.

LITTLE ROCK, ARK.—Plans are being made to install an electric light plant in the Niemeyer mill, just west of this city. The plant will have an output of 150 kilowatts and will furnish electrical energy for lamps and motors for the mill and also for lighting the residences in the vicinity of the mill. Contracts have already been placed for the machinery.

PRESCOTT, ARIZ.—Plans have been completed by the Arizona Power Company for the construction of a hydro-electric plant on Fossill Creek Falls, 50 miles distant, to furnish electricity to various small towns and mines throughout the county. R. L. Masson is electrical engineer.

TUCSON, ARIZ.—E. B. Reeser, secretary and treasurer of the Mineral Hill Consolidated Mining Company, states that the company has made arrangements to erect a large concentrating and electric light plant at once.

VEGREVILLE, ALB.—It is reported that an electric light plant will be erected in this town to furnish electricity for both street and commercial lighting.

ARCATA, CAL.—The California Barrel Company is planning to enlarge its factory and will equip its plant to be operated by electricity.

GOLDFIELD, CAL.—Owing to protest of the Goldfield Chamber of Commerce and the Merchants' Association of this city the Nevada-California Power Company has agreed to reduce the rates in Goldfield for electricity for lamps from 25 to 30 per cent.

GROVELAND, CAL.—The Golden Rock Ditch Company will soon commence work on the erection of an electric plant. The National Park Electric Company will also soon begin work on the construction of its proposed electric plant.

RICHMOND, CAL.—The Trustees have granted a franchise to John Nicholl to erect an electric street railway.

SAN JOSE, CAL.—Owing to the excessive charge in the bid submitted by the United Gas & Electric Company for one-year lighting contracts, the Common Council has decided to put through an ordinance providing that rates shall be fixed by the Mayor and Common Council, based on sworn statements from the company. The Mayor and the Common Council are also considering an ordinance providing for the disfranchisement of the San Jose Railroad Company, which have been in bad condition for the past two years.

NEW BRITAIN, CONN.—The stockholders of the Stanley Works Company have voted to adopt the amendment to its charter granted by the last Legislature, which gives the company authority to transmit electricity from Kent to operate and light its plant in New Britain. The amendment also authorizes the company to increase its capital stock from $1,500,000 to $3,000,000. The company is planning to erect a hydro-electric plant on the Housatonic River at Kent.

WILMINGTON, DEL.—Bids will be received by the Street and Sewer Department until Jan. 28 for lighting the streets of the city. The specifications call for electrical energy for not less than 350 arc lamps and 428 incandescent lamps. The new contract is for a term of five years beginning July 1, 1908.

ACKWORTH, GA.—Application has been made to the City Council by Austyn Granville, of New York, N. Y., for a franchise to construct an electric railway through the city. It is proposed to operate the electric railway from Ackworth to Kenesaw, Lena Elizabeth, thence to Marietta, and north to Cartersville. Part of the track has already been laid and orders have been placed for part of the machinery.

COLUMBUS, GA.—W. S. Greene, receiver of the Columbus Water Works Company, is contemplating installing an additional unit at the water works pumping station. Arrangements have been made with the Columbus Power Company for additional energy.

LAFAYETTE, GA.—John A. Clements, city recorder, writes that the citizens on Jan. 7 voted to issue $10,000 in bonds for the construction of an electric light plant.

LA GRANGE, GA.—J. R. Black, superintendent of the municipal electric light station, writes that plans are being considered to enlarge the plant, the cost of which is estimated at from $10,000 to $20,000.

BOISE, IDAHO.—Plans are being made by the Capital Electric Light, Motor & Gas Company to commence more active work on the Ox Bow project on the Snake River, near Huntington. It is stated that work will soon be started on the construction of a transmission line 65 miles in length to connect with the plant near Huntington, which will connect Meridian, Emmett, Payette and Weiser. It is proposed to build an additional line from Weiser 50 miles in length to make complete connection with the plant after the first line has been constructed. O. F. G. Markhus is manager of the company.

DES MOINES, IA.—The Mutual Telephone Company, of Des Moines, is contemplating the absorption of the telephone lines in the southern part of the State, which are valued at nearly $1,000,000. The largest of these companies are the Hawkeye Telephone Company, the Southern Iowa, the Knoxville Electric, the Boone County Telephone companies and the Jasper County lines, and also the lines which cover the territory around Atlantic and Red Oak.

RICEVILLE, IA.—The stockholders of the Riceville Electric Light & Power Company have appointed a committee to consider the question of installing a new plant. B. N. Hendricks is a member of the committee.

CAIRO, ILL.—The City Council has granted the Cairo Terminal Traction Company a franchise to build an interurban road into Cairo.

DECATUR, ILL.—E. S. McDonald, Mayor, writes that the city does not expect to rebuild the electric light plant this year.

LEROY, ILL.—It is reported that T. L. Parks has sold the Leroy telephone system to B. F. Baker, of Glenavon, for $20,000, who will take charge of the system March 1.

MORRISON, ILL.—The capital stock of the Whiteside Farmers' Mutual Telephone Company has been increased from $10,000 to $20,000.

OQUAWKA, ILL.—The local electric light plant has been purchased by the town and will be operated as a municipal plant. The price paid for the plant was $4,500.

GRANDVIEW, IND.—The town officials are anxious to have an electric light plant installed in the town and are ready to promise financial assistance in the way of patronage.

ROANOKE, IND.—The Town Council has passed an ordinance granting a 99-year franchise to the Fort Wayne & Wabash Valley Traction Company to light the streets and do a commercial lighting business in Roanoke.

SPRINGPORT, IND.—The capital stock of the Rural Telephone Company has been increased from $4,000 to $6,000.

QUASQUETON, IOWA.—S. B. Howard has petitioned the City Council for a franchise for a water works and electric light plant.

GRISWOLD, IOWA.—The Griswold Light & Power Company has been granted a franchise to construct and maintain an electric light plant. The proposed plant will cost about $3,000. R. C. Prather and J. M. McAvoy are interested in the enterprise.

IOLA, KAN.—The Department of Public Utilities is contemplating extending the lighting circuits of the municipal electric light plant to the residence portion of the city. N. E. Stone is chief electrician.

LECOMPTE, LA.—We are informed that bids will be received about March 1 for the construction of the new municipal electric light plant. The cost of the plant is estimated at about $10,000. B. Wood, of New Orleans, is engineer.

NEW ORLEANS, LA.—The People's Brewing Company will soon commence the erection of its plant, which will include the construction of an electric power plant and ice plant. The company will also install a system of electric delivery trucks.

NEW ORLEANS, LA.—Captain R. H. von Ezdorf, of the United States Public Health and Marine Hospital Service, in charge of the Federal quarantine station, is planning extensive improvements to the station, including the installation of an electric light plant.

ANDOVER, MASS.—The Smith & Dove Manufacturing Company is contemplating the erection of a new power plant in the spring.

CLINTON, MASS.—Plans are being prepared by the Bigelow Carpet Company for the construction of a new power house, which will furnish light and heat not only to the new mill, but the old plants as well.

HAVERHILL, MASS.—Announcement has been made by the Haverhill Electric Company that it will commence the work of placing its wires underground in the spring as soon as the weather will permit. The cost of the entire work is estimated at $200,000.

MANSFIELD, MASS.—The Boston & Providence Interurban Electric Railway Company has filed with the Selectmen of Foxboro and Mansfield the plans for the location of the road. E. J. Wood is engineer.

ELLSWORTH, ME.—The new dam of the Bar Harbor & Union River Power Company is practically completed, and it is expected to have the power house in readiness to put the plant into operation early in February. The local service will be transferred to the new power house, and the present electric light station will be used as a pumping station for the city water supply; extensive improvements will be made, including the installation of another 600,000-gal. pump. The pump will be driven by an electric motor, already installed. The steam plant will be held as an auxiliary plant to be used in case of emergencies. This plant was described and illustrated in Electrical World for Sept. 21, 1907.

HOULTON, ME.—On Jan. 1 the town took over the plant of the Houlton Electric Light & Power Company and will operate the system until the plant at Aroostock Falls is started. B. B. McIntyre is superintendent.

NEWPORT, ME.—The committee on electric lighting has decided to replace arc lamps on the streets with clusters of incandescent lamps of 32 candle-power each.

PITTSFIELD, ME.—It is reported that a new company will soon be organized by George H. Morse and Elmer D. Smith and others to take over the property of the Pittsfield Electric Company and the Pittsfield Manufacturing Company.

PORTLAND, ME.—The United Illuminating Company, of Boston, Mass., which holds the controlling interest in the subsidiary companies doing business in Fort Fairfield, Belfast, Farmington, Dexter and Eastport, is restrained from making a common-law assignment by an injunction issued by Judge Strout of the Supreme Court, on petition of a number of stockholders, who desire to place the business in the hands of a receiver.

SHARPSBURG, MD.—A committee has been appointed by the Town Council to carry on negotiations with John Livers, of Shepherdstown, W. Va., in connecting with granting the latter a franchise to construct an electric lighting system in the town. Electrical energy for operating the system will be supplied from Shepherdstown and Martinsburg, W. Va.

WESTMINSTER, MD.—The exchange of the United Telegraph & Telephone Company was burned Jan. 12. The switchboard was destroyed, and the subscribers will be without telephone service until a new switchboard is installed.

IONIA, MICH.—The contract for municipal lighting has been awarded to the Ionia Water Power Company for a term of one year.

REED CITY, MICH.—It is reported that the electric plant of the Reed City Electric Company has been sold to George Westover, of Cadillac.

WOLVERINE, MICH.—The Village Council has granted B. F. Stiffler, of Birmingham, an electric light franchise.

MINNEDOSA, MINN.—Negotiations have been completed by the Minnedosa Power Company for the purchase of the local electric light plant, and arrangements have been made with the town for the commencement of the construction work on the proposed power plant of the company. H. F. Maulson is president of the company.

ORTONVILLE, MINN.—The citizens are considering the question of making additions to the equipment of the municipal electric light plant. J. F. Swiener is superintendent.

HALE, MO.—The electric plant of the Citizens' Light & Power Company at this place has been sold to Edgar Jackson, of Carrolton, who will erect a new power station and install a new engine.

ST. LOUIS, MO.—Application for an electric light and power franchise covering all parts of St. Louis County has been made to the County Court by the Clayton Electric Company. The application was filed by R. H. Stevens, of Clayton.

AXTELL, NEB.—The telephone exchange of the Bell Telephone Company in this place was recently destroyed by fire.

BEATRICE, NEB.—The plant and property of the Wanaska Electric Company in this place have been sold by the receiver to C. A. Snyder, of Auburn, who is dismantling the plant and selling the property.

FREMONT, NEB.—Frank Hammond, secretary of the Board of Public Works, writes that the contract for erecting the power station for the water works and electric light plant has been awarded to G. A. Damerer, of Chicago, Ill., for $22,500.

WAHOO, NEB.—The telephone lines owned by O. M. Tharp, of this place, covering the territory of Weston, Malmo, Prague and Morse Bluffs, in Saunders County, have been sold to J. Jamison, of Alvo, the consideration being $160,000. Mr. Jamison took possession Jan. 2.

CLINTON, N. C.—The Clinton Electric Light & Power Company has been reorganized and the capital stock increased. New machinery will be installed in the power plant. The officers of the company are: A. D. O'Brien, president; D. L. Bonny, vice-president; A. McD. Graham, secretary and treasurer.

FAYETTEVILLE, N. C.—A survey of the Cape Fear River has been made for two or three miles below the Buckhorn Falls, and the engineers report to the Phoenix Construction Company (successors to the Cape Fear Electric Power Company) that 18,000 horse-power is available by development, in addition to the 4000 horse-power now generated. The Holt-Morgan, Holt-Williamson and Lakeview Cotton Mills have installed extensive electrical machinery, and will operate their mills by electrical energy supplied by the Buckhorn Falls plant.

FAYETTEVILLE, N. C.—The Carolina Telephone & Telegraph Company has awarded a contract for the erection of its new building in this city. A. C. McCleare is general manager.

SILVER CITY, N. M.—The New Mexico Light, Heat & Power Company is installing additional machinery in its plant, including a 100-kw, 2200-volt generator. The present building will be enlarged, and the changes in the plant will require the complete reconstruction of the transmission lines.

BATH, N. Y.—E. J. G. Tower, president of the Citizens' Electric Service Company, writes that it is proposed to construct an electric light plant to supply electricity in Bath, Kenora and Avoca. The cost of the plant is estimated at $75,000.

CHATHAM, N. Y.—The village trustees have made a contract with the Chatham Electric Light, Heat & Power Company to light the streets of the village for a term of five years. The company agrees to furnish nine arc lamps at $85 per lamp per year, five arc lamps at $75 each per year, and not less than 100 incandescent lamps of 25 cp at $1.30 per lamp per month.

HUDSON, N. Y.—The Common Council has made a contract with the Albany & Hudson Railway Company to furnish electricity for lighting the streets and buildings for four months. The Council on Feb. 28, 1907, awarded the contract for city lighting to Jonathan T. Rider, of Hudson, who submitted a bid to furnish arc lamps at $49 each per year, and incandescent lamps of 32 candle-power for $10 per lamp per year. The contract with the Albany & Hudson Company recently expired and a temporary contract was made to furnish the energy for lighting until the plant of Mr. Rider is completed. Under the temporary contract the city is paying $84.75 per year for each arc lamp and 10 cents per kw-hour for lighting the public buildings.

MINEOLA, N. Y.—The New York & North Shore Traction Company has made application to the Supervisors of Nassau County for a franchise to construct an electric railway from Mineola to Westbury.

LOWVILLE, N. Y.—The Black River Telephone Company has commenced the extension of its lines from Deer River to Carthage, where the company proposes to maintain an exchange.

WATERLOO, N. Y.—The Village Board is considering the question of extending and improving the street lighting system and substituting an all-night service in place of the present service, which extends only till midnight on a moonlight schedule. The Geneva-Seneca Company has submitted a proposition to the board as follows: The company offers to furnish 26 enclosed arc lamps for $70 each per year, and 117 incandescent lamps of 30 candle-power at $18 per lamp per year, making the cost of the street lighting $4,066 per year, as against the present cost of $3,512. The company agrees to furnish one arc lamp and 30 incandescent lamps free of charge. All the lamps, apparatus and most of the wiring will be new. The contract is for a term of five years and provides for an all-night and every night service.

AKRON, OHIO.—Arrangements are being made for extensive improvements to the system of the People's Telephone Company in Cuyahoga Falls. A complete new telephone system, including switchboard, will be installed during the coming year.

BATAVIA, OHIO.—The Citizens' Telephone Company was placed in the hands of a receiver Jan. 13. In the application for a receivership made by W. Guy Jones, a stockholder, it was alleged that the company was $211,000 in debt and that business was being conducted at a net loss. The capital stock of the company is $150,000.

CUYAHOGA FALLS, OHIO.—A franchise has been granted to the Falls Rivet & Machine Company to construct a power plant on the Cuyahoga River.

MASSILLON, OHIO.—The Massillon Electric & Gas Company, recently incorporated, will take over the plant and holdings of the Massillon Light, Heat & Power Company. Robert R. Choate, of Knoxville, Tenn., will succeed Warren E. Russell as manager of the plant.

MECHANICSBURG, OHIO.—The Mechanicsburg Light & Power Company is contemplating installing a 15 or 20 kw, direct-current, 220-volt vertical generator in its plant. T. J. Long is president and manager.

MIDDLETOWN, OHIO.—The Middletown Telephone Company has purchased a site on which it will erect a new exchange building. The automatic system will be installed.

WEST MILTON, OHIO.—L. A. Pearson writes that it is proposed to build a hydro-electric plant of about 200 horse-power the coming summer. The dam will be about 400 feet long with a head of from 14 to 16 feet.

PAULS VALLEY, OKLA.—The business men of the city have secured an engineer to make a survey of the river near the town with a view of developing the water power and installing an electric light plant for the city.

GRESHAM, ORE.—The Mount Hood Railway Company and the Portland Railway Light & Power Company, of Portland, have applied to the City Council for franchises for a term of 25 years. The latter company asks for electric light and power privileges in the city.

MIDDLETON, ORE.—A company, under the name of F. Vandivort & Co., has been formed by F. Vandivort and others to install an electric lighting system to light the streets and residences of the town. Electrical energy for operating the system will be taken from the Swan Falls transmission line. A 24-hour service will be given and meters will be installed. Several farmers are contemplating installing motors for irrigation. F. Vandivort has charge of installing the system.

PORTLAND, ORE.—The United Railroad Company has filed an application with the County Commissioners for a 25-year franchise to operate an electric railway to the Clackamas County line. A. C. Emmons is counsel for the company.

SCIO, ORE.—The City Council has recently placed an order with the General Electric Company, of Schenectady, N. Y., for a generator and accessories for the municipal electric light plant. The cost of improvements to the plant is estimated at $1,500.

DALLAS, PA.—Plans are now under way for the construction of an electric light plant to furnish electricity to light the Raub Hotel. It is proposed to erect a plant of sufficient size to supply electrical energy to light the towns of Shaverton and Trucksville.

HANOVER, PA.—The Hanover & McSherrystown Street Railway Company has filed with the State Department a notice of an increase of bonded indebtedness from nothing to $500,000.

LANCASTER, PA.—The Conestoga Traction Company has been granted a franchise by the Borough Council of Christiana to construct an electric railway through the borough. The company will soon commence work on the construction of the line from Christiana to Atglen, a distance of five miles.

PITTSBURG, PA.—The contract for lighting the city with arc lamps has been awarded to the Allegheny Light Company. The contract calls for $90 per lamp per year where underground circuits are used and $72 per lamp with overhead wires.

WARREN, PA.—The Warren & Jamestown Street Railway Company has filed a notice of an increase of bonded indebtedness from $300,000 to $400,000.

PROVIDENCE, R. I.—A bill has been presented in the Senate by Senator Cole, of Hopkinton, providing for the construction of an electric railway system between Westerly and Ashaway. The charter as proposed names Leveritt A. Briggs, William J. Battey, Alexander B. Briggs, Frank Hill and John W. Sweeney as the incorporators, and the capital stock is placed at not exceeding $100,000. It allows the acquisition of property by condemnation proceedings, and also permits the proposed corporation to engage in the generation and sale of electricity for heat, light and power.

SENECA, S. C.—The citizens have voted in favor of issuing bonds for the construction of an electric light plant.

SUMMERVILLE, S. C.—The Town Council has granted the Charleston-Summerville Electric Railway the right of way through certain streets in the town for the operation of its railway. Ogden Edwards, of Summerville, is president of the company.

NASHVILLE, TENN.—The City Council is considering the question of making an appropriation of $100,000 to build an addition to the power house and install new machinery in the municipal electric light plant.

CAMERON, TEX.—The Southwestern Telephone Company is planning to make improvements to the local system and will install complete new equipment.

CLARENDON, TEX.—A telephone company has been organized by William Gray, George W. Washington and T. L. Benedict to establish an exchange in Clarendon. The cost of the system is estimated at $20,000.

DALLAS, TEX.—The City Council has granted E. L. Swaine and R. P. Boyer, of San Angelo, Cal., a franchise to construct a telephone system in this city.

PARIS, TEX.—We are informed that the Paris Transit Company is contemplating the purchase of an electric fountain for Warlick Park, and also proposes to install a 400-hp water tube boiler and to build 800 feet of single track. John A. Porter is manager.

DENTON, TEX.—The City Council is contemplating increasing the equipment of the municipal electric light plant by the installation of an additional engine and generator.

MARBLE FALLS, TEX.—Plans are being made by Dallas and New York capitalists to construct a hydro-electric plant at Marble Falls, on the Colorado River, for the development of electrical energy to be transmitted to Austin and San Antonio, a distance of 150 miles. It is planned to construct a concrete dam across the Colorado River 1012 ft. long and 17 ft. high above the falls. The plant will have an output of 12,000 horse-power. It is stated that a contract has already been placed to furnish the city of San Antonio with 1000 horse-power. John W. Maxcy, of Houston, has been awarded the contract for the engineering and construction work.

SHERMAN, TEX.—The Southwestern Telegraph & Telephone Company has applied to the City Council for a franchise to place its wires underground in Sherman. J. E. Farnsworth is vice-president and general manager.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company has filed with the City Recorder its acceptance of the franchise passed by the Council Dec. 2.

SALT LAKE CITY, UTAH.—Announcement has been made that the Utah Light & Railway Company will erect a hydro-electric plant at Devil's Gate, 18 miles from Ogden, work on which will commence early in the spring. The plant will have an output of 2000 horse-power and will cost $300,000. The company will also construct a large steam plant in the city, at a cost of about $250,000.

STOWE, VT.—The Mt. Mansfield Electric Railroad, which runs from Stowe to Waterbury, a distance of 10½ miles, has been purchased by Arthur H. Soden for $20,000. Mr. Soden contemplates extending the line to Morrisville, a distance of eight miles.

MIDDLEBURY, VT.—A new boiler is being placed in the plant of the Middlebury Electric Light Company.

BLACKSBURG, VA.—It is reported that the Blacksburg Power & Supply Company will install an electric light plant.

RADFORD, VA.—The Radford Water Power Company is planning to purchase a water turbine from 400 to 500 hp. J. A. Baird is secretary of the company .

RICHMOND, VA.—The Virginia Passenger & Power Company has placed contracts with James Leffel & Company for a pair of 56-in. Sampson turbines to be direct connected to a 750-kw, Allis-Chalmers alternator.

SUMAS, WASH.—The Whatcom County Railway & Light Company is planning to increase the output of its plant from 3200 to 10,000 horsepower. Surveys are now being made for the route of a large flume to the plant at Nooksack Falls.

EAU CLAIRE, WIS.—The Common Council has authorized the city clerk to advertise for bids for gas and electric lighting for the city.

SUMAS, WASH.—A new 75-kw, three-phase generator is now being installed in the local electric light plant, which will more than double the present output. Arc lamps will soon be placed on the streets.

KEWAUNEE, WIS.—H. G. Steingraeber, city clerk, writes that the citizens on Jan. 14 voted in favor of establishing a municipal electric light plant.

RACINE, WIS.—The City Council has granted the Milwaukee Electric Railway & Light Company a franchise to build a street car line on Second Street, from Main Street to Lake Avenue.

WATERLOO, WIS.—Extensive additions are being made to the municipal electric light plant, including the construction of a new power house and extension of transmission lines. Eugene Porter is chief engineer.

REVELSTOKE, B. C.—Plans are being considered for increasing the equipment of the municipal electric light plant, which includes the installation of a 400-hp gas engine and a gas producer plant; also a 150-kw generator for furnishing electricity for motors. The present plant will be used for lighting only. C. H. B. Topp is city engineer.

LONDONDERRY, N. S.—The Londonderry Iron & Mining Company contemplates developing power at Nixteaux Falls to be used for the operation of its mines.

GANANOQUE, ONT.—The citizens have voted in favor of the by-law authorizing the town to issue $10,000 in debentures to complete and to pay for debts already contracted for the electric light plant.

GODERICH, ONT.—The citizens have voted in favor of the by-law to transfer the guarantee of the bonds of the Maitland River Power Company to the Ontario West Shore Railway.

HAVELOCK, ONT.—The Northumberland-Durham Power Company contemplates making an application to the Dominion Government for permission to develop power at the Upper Healy Falls. It is stated that 14,000 horse-power can be developed there.

PORT ARTHUR, ONT.—It is reported that the Pigeon River Lumber Company has applied to the city for electrical energy to operate the large pulp mills which it proposes to erect.

PORT ARTHUR, ONT.—Smith, Kerry & Chace, Confederation Life Building, Toronto, are preparing plans for developing the water power on Dog Lake at Silver Falls, for the city of Port Arthur. As soon as estimates are completed a by-law will be submitted to the citizens to secure funds for the work.

PORT HOPE, ONT.—The by-law authorizing the Town Council to proceed with the construction of a municipal electric light plant was carried.

STRATFORD, ONT.—The City Council is contemplating an issue of $35,000 in electric light debentures.

WINNIPEG, MAN.—The Provincial Government has appointed a commission of three to take charge of the Bell telephone system, which it recently purchased. The commissioners appointed to have charge of the system are: F. C. Patterson, chairman, and W. H. Haynes and H. J. Horan.

WOODSTOCK, ONT.—John Morrison, city clerk, writes that the citizens have voted in favor of the proposition to issue $27,500 in bonds to establish an electric light system in connection with the Hydro-Electric Power Commission of Ontario. The work will not be undertaken until 1909.

New Industrial Companies.

THE ROYAL EASTERN SUPPLY COMPANY, of New York, N. Y., has filed articles of incorporation, with a capital stock of $35,000. The directors are Francis E. Neagle, Eugene Congleton and Edward J. Ryan.

THE ROTARY INTERNAL CONSTRUCTION ENGINE COMPANY, of Newark, N. J., has filed articles of incorporation, with a capital stock of $200,000. The incorporators are: John Hokanson, Moritz Hoffman and Oscar Anderson.

THE PARAGON ELECTRIC COMPANY, of Camden, N. J., has been incorporated, with a capital stock of $125,000, by W. E. Groves, R. Warren Caster and others. The company proposes to manufacture electrical lamps, lighting apparatus, specialties, etc.

THE HOUSTON ARMATURE WORKS, of Houston, Tex., has been incorporated, with a capital stock of $10,000. The company proposes to carry on a general mechanical and manufacturing business. The incorporators are: F. E. Ward, L. E. Ward and E. T. Barden.

THE AMERICAN AMUSEMENT & CONSTRUCTION COMPANY, of Memphis, Tenn., has been incorporated, with a capital stock of $50,000, by James L. Glass, S. Trauerman, O. D. DuBose, E. Susman and John Wright. The company proposes to construct amusement devices, build street railways and power plants.

Company Elections.

CEDAR RAPIDS, IOWA.—At the annual meeting of the Cedar Rapids & Marion Telephone Company the present board of directors and officers were re-elected.

IOWA CITY, IOWA.—At the annual meeting of the North Liberty Mutual Telephone Company held recently the following named officers were elected: Alex. Moreland, president; Harry Gill, vice-president; L. L. Stoner, secretary and treasurer.

MEDIAPOLIS, IOWA.—At the annual meeting of the Mutual Telephone Company held Jan. 7 the following named officers were elected: Henry Breder, president; Herman Walker, vice-president; John L. Jones, secretary, and A. E. Miller, treasurer.

LOUISVILLE, KY.—At a meeting of the stockholders of the Kentucky Electric Company held Jan. 8 the following named gentlemen were elected officers for the ensuing year: Robert E. Hughes, president; Lawrence Jones, vice-president, and Byron Allen, secretary. Mr. Hughes, president of the company, states that the power house will be completed and in operation within three months.

SAGINAW, MICH.—At the annual meeting of the Saginaw Valley Telephone Company held Jan. 14 the following named officers were elected: E. T. Carrington, president; John L. Jackson, vice-president; E. P. Waldron, secretary, and J. F. Brand, treasurer.

LITTLE FALLS, N. Y.—At the annual meeting of the Interstate Telephone Company held recently the following named officers were elected: Eugene Walrath, president; John Hurley, vice-president; George G. Hakes, secretary, and George D. Smith, treasurer.

ROME, N. Y.—At the annual meeting of the Home Telephone Company held Jan. 8 the following-named officers were elected: J. S. Wardell, of Rome, president; D. M. Hall, of Rome, vice-president; W. Roy McCane, of Rochester, secretary, and Charles H. Poole, of Utica, treasurer.

FERNWOOD, OHIO.—At the annual meeting of the Farmers' Telephone Company held Jan. 13 the following-named officers were elected: John J. Gault, president; John T. Martin, vice-president and general manager; W. Reid Scott, secretary, and J. R. Hine, treasurer.

ALLENTOWN, PA.—At the annual meeting of the Lehigh Valley Transit Company held recently the following-named directors were elected: R. H. Stevens, Col. Harry C. Trexler, E. M. Young, George O. Albright, of Allentown; Mayor Tom L. Johnson, of Cleveland; George H. Frazier, William F. Harrity, Edward B. Smith, C. E. Ingersoll and John C. Dawson, of Philadelphia. R. H. Stevens was re-elected president and John C. Dawson was elected vice-president.

DALLAS, TEX.—At the annual meeting of the Dallas Consolidated Electric Street Railway Company held recently the following-named officers were elected: J. B. Wilson, president; W. C. Connor, vice-president; Edward T. Moore, secretary and treasurer.

DALLAS, TEX.—At the annual meeting of the directors of the Metropolitan Street Railway Company the following-named officers were elected: George W. Owens, president; B. M. Burgher, vice-president; C. F. Kirchaine, secretary, and P. P. Thomas, treasurer.

GLENWOOD, WIS.—At the annual meeting of the Western Wisconsin Telephone Company, held recently, the following named officers were elected: W. H. Park, president; A. J. Vanderheiden, vice-president, and R. A. Cleveland, secretary and treasurer.

New Incorporations.

IOWA CITY, IA.—The Lincoln Telephone Company has been incorporated with a capital stock of $1,500 to build a telephone system in Lincoln Township.

SOLON, IA.—The Morse & Solon Telephone Company has been incorporated with a capital stock of $2,000. William Cahill is president of the company.

KELLOGG, IDAHO.—Articles of incorporation have been filed for the North Idaho Telephone Company with a capital stock of $25,000 by W. F. Goodard and others.

CHICAGO, ILL.—The Southern Street Railroad Company, of Chicago, has been incorporated, with a capital stock of $10,000, to operate street railways in Cook County. The incorporators are: J. C. Cleary, John Early and E. J. Stevens.

NEW ATHENS, ILL.—The Point Lookout Telephone Company has been incorporated with a capital stock of $350 by A. Sturm and others.

PINKSTAFF, ILL.—The Farmers' Pioneer Mutual Telephone Company has been incorporated with a capital stock of $2,500 by J. Deer, J. W. Childress and R. W. Kingsbury.

SEYMOUR, ILL.—The Seymour Telephone Company has filed articles of incorporation, with a capital stock of $2,500. The incorporators are: A. S. Cott, W. E. O. Christe and William Osborn.

MOORESVILLE, IND.—The Mutual Telephone Company has been incorporated with a capital stock of $7,000 by E. Stone and others.

FOREST CITY, IOWA.—The North Madison Telephone Company has been organized and the following named officers elected: Leonard Steiff, president; W. H. Ellsworth, vice-president; E. C. Howland, secretary, and A. E. Howland, treasurer.

FLINT, MICH.—Articles of incorporation have been filed for the Genesee County Telephone Company with a capital stock of $125,000. The directors are Joseph W. Martin, Thomas Ahearn and John N. Anhut, of Detroit. The company has been formed to take over the telephone franchise granted by the City Council several weeks ago.

BOZEMAN, MONT.—The Bozeman Home Telephone Company has been incorporated with a capital stock of $80,000 by J. S. Haley and others.

CATHAY, N. D.—Articles of incorporation have been filed for the Cathay Central Telephone Company with a capital stock of $10,000 by B. W. Taylor and others.

TRENTON, N. J.—The Eureka Power Company has been incorporated, with a capital stock of $100,000, by Theodore G. Kitchen, J. D. McNeal and N. Van Fleet. The company proposes to operate electric plants.

BROOKLYN, N. Y.—The Economy Electric Company has filed articles of incorporation, with a capital stock of $25,000. The directors are: H. F. D. Kelsey, of Freeport; George P. Fall, of New York, and Donald Bayliss, of Brooklyn.

BUFFALO, N. Y.—The Keyes Electric Company has filed a certificate of incorporation with the Secretary of State, with a capital stock of $12,000. The company proposes to furnish electrical energy for heat and light in the villages near Buffalo.

BUFFALO, N. Y.—Articles of incorporation have been filed with the Secretary of State for the Electric Navigation Company, with a capital stock of $100,000. The directors are: William J. Larkworthy, A. Stuart Allaster and Alexander McDougall, of Buffalo, N. Y.

JEFFERSON, N. Y.—Pierce & Peaslee Rural Telephone Company has been incorporated with a capital stock of $9,000 by Seymour J. Pierce and others.

NEVADA, OHIO.—The Nevada Telephone Company has been incorporated with a capital stock of $30,000 by Abe Swartz and others.

STIDHAM, OKLA.—The Oklahoma Telephone Company has been incorporated with a capital stock of $1,000 by Virgil E. Hill, Frederick L. Smith, Robert E. L. Crowson, Thomas C. Beeler and Henry A. McDaniel.

PIERRE, S. D.—The St. Paul, Minneapolis & Seattle Electric Railway Company has filed articles of incorporation with the Secretary of State, with headquarters at St. Paul. The incorporators are William C. Webber, of Rochester, Minn.; David Phillips, of Mazeppe, Minn.; Samuel A. Philips and James W. Mossop, of St. Paul, Minn., and Glenn W. Martens, of Pierre.

DIXON SPRINGS, TENN.—The Dixon Creek Telephone Company has been organized with a capital stock of $700.

Legal.

NOT CONTRIBUTORY NEGLIGENCE FOR LINEMAN TO STEP ON SPAN WIRE.—A recent action by the administrator of the estate of a lineman, who had been in the employ of a telephone company, against an electric light company, brought out the following facts: The telephone company and the defendant light company made use of certain poles together and on one of these poles the defendant company maintained an arc lamp, which was supported by a span wire attached to the pole and to another pole on the opposite side of the street. Passing under this span wire, about midway between the two poles, were strung two highly charged feed wires. As originally installed, the span wire was about two feet above the feed wires, but by reason of the negligent removal of a guy wire some two weeks before the accident, the pole tilted so that the span wire became slack and sagged to such an extent that a contact was formed between the span wire and the feed wires, by reason of which the span wire became heavily charged. The lineman, while ascending the pole, without knowledge that the span wire was charged, stepped upon it and at the same time came in contact with a telephone wire owned by the telephone company, causing his death. The claim of the defense was that the lineman was guilty of contributory negligence in stepping upon the span wire, but it was held that that was a question for the jury to determine, and the jury decided against the company and held it in damages. Leque vs. Madison Gas & Electric Co., Supreme Court of Wisconsin, 113 N. W. Rep. 936.

ELECTRICAL COMPANY HELD FOR INJURY RESULTING FROM DEFECTIVE TRANSFORMER.—As a result of the failure of the transformer placed outside a blacksmith shop to properly perform its functions, the company owning it was held liable for $1,700 damages to one who was injured by taking hold of one of the flexible wire cords, with incandescent lamps attached, with which the blacksmith shop was equipped. From the evidence it appeared that the plaintiff, a boy of 17 years, had been employed at intervals in the shop, and had frequently carried the lamps on the flexible cords from point to point in the shop to aid in the shoeing of horses. The injury in question occurred early in the morning, after a heavy rain. Upon arriving at the shop the blacksmith, whose name was Rogerson, found the doorknob charged with electricity, and could not open it; nor did a passerby who tried succeed in doing so, but it was finally opened by a man wearing rubber boots. When Rogerson picked up his leather apron, after gaining admission to the shop, he received a shock. He discovered, also, that some iron horseshoes hanging on the wall were charged with electricity, and, as the plaintiff and others came into the shop that morning, some sport was made by having them touch the shoes, resulting in slight shocks, more or less irritating,

according to the physical condition of the person, but no one sustained any injury. After a time it was observed by some one in the shop that the beam from which one of the drop lamps hung was smoking, and that the wire at that point was sparking. The attention of Rogerson being directed to this, he called upon the plaintiff to assist him in moving the wire. As the plaintiff grasped the cord the current broke through the insulation and rendered him unconscious, necessitating the amputation of three of his fingers. One of the men in the shop discovered, after the accident, in attempting to tie a horse to the iron ring on the pole to which the transformer was affixed, that the ring was so charged that he could not tie the horse; and another who undertook to tie the horse was unable to do so, but succeeded in tying the strap around the pole. Under these facts the company was held liable. Rice vs. Wheeling Electrical Company, Supreme Court of Appeals of West Virginia, 59 S. E. Rep. 626.

TWO-CENT FARE UNCONSTITUTIONAL.—An important decision on rates has just been rendered by the Supreme Court of Pennsylvania, which has confirmed the decision of the lower tribunal, the Common Pleas Court of Philadelphia, in finding the two-cent fare law unconstitutional. The upper court stood 4 to 3 on the matter and said: "The court below found that the act does injustice to the corporators, in that it reduces the returns from the property to such an extent as to render it unremunerative. The corporation is entitled to make a fair profit on every branch of its business, subject to the limitation that its corporate duties must be performed even though at a loss. The conclusion of the court below that the enforcement of the act of 1907 against the complainant would do injustice to the corporators is beyond just criticism."

Business Notes.

BURNLEY BATTERY.—Geo. M. Mayer, 1085 Old Colony Building, Chicago, designing electrical and mechanical engineer, has taken the agency of the Burnley Battery Manufacturing Company.

SWITCHBOARD EQUIPMENT COMPANY, of Bethlehem, Pa., informs us that Mr. Walt W. Geisse is now handling the "S. E." circuit breaker in the northern half of Wisconsin and the states of North and South Dakota and Minnesota. The Engineering Equipment & Supply Company has taken the agency for the breaker for eastern Canada.

THE STANDARD PAINT COMPANY, of 100 William street, New York City, has during the past year added to its line of insulating compounds and varnishes a high-grade impregnating compound to be used in connection with the vacuum process. It has also made somewhat of a new departure in that it is supplying, where called for, its old P. & B. compound in a form from which the strong odor and gases are entirely eliminated. The distinctive smell of P. & B. compound is well known to every one in the electrical line, and the company says that in some instances where the stock is to be employed in closely confined locations this feature is somewhat of an objection. It is to meet such conditions that it has prepared the P. & B. in this special manner and is in a position to furnish it or the regular stock, as called for.

THE LORD ELECTRIC COMPANY has taken over all rights, titles and interest in patents granted and pending Mr. W. P. Cosper, covering controller regulators. Mr. Cosper has been awarded the agency for the Central Western territory, making his headquarters at Chicago, Ill., instead of being located at New York, as originally announced. Mr. Cosper is to assume the position of Central Western representative of the Lord Electric Company. His controller regulators are, it is stated, unique and cover all desirable features of a regulator to control positively the acceleration of motors. Many new features are embodied in these devices appealing to the railway manager. The Lord Electric Company is preparing to fill orders now in hand and accumulate stock for future demands.

THE GOODMAN MANUFACTURING COMPANY, Chicago, announces that the A. W. Wyckoff Company, 2323-24 Farmers' Bank Building, Pittsburg, Pa., has been appointed exclusive selling agent for its electric coal mining machinery in the states of Pennsylvania, Ohio, New York, Maryland and in the B. & O. district of West Virginia, and has assumed charge of its Pittsburg office, now located at the above address. A. W. Wyckoff, president of the A. W. Wyckoff Company, is well known in electrical circles, having represented electrical companies in the Pittsburg section during the past few years. Mr. W. B. Clarke, former manager of the Pittsburg office of the General Electric Company and who for many years was with its power and mining department, has associated himself with the A. W. Wyckoff Company and will devote his time especially to the electrical coal mining and haulage machinery. Mr. L. L. Brande, former engineer and manager of the Pittsburg office, remains in Pittsburg and continues his work with the A. W. Wyckoff Company.

Obituary.

MR. EDWIN BAILEY, one of the incorporators of the Patchogue Electric Light Company, died Jan. 11 at his home in Patchogue, N. Y., of pneumonia. He was born in England in 1836 and came to this country when 12 years of age. He was also interested in banking institutions and other enterprises.

MR. WILLIAM M. MALLETT, formerly of Rochester, N. Y., died at the Presbyterian Hospital, New York, N. Y., Jan. 12. He was the first manager of the Bell Telephone Company in Rochester, N. Y., and had charge of the construction of the system. He has been in New York City since 1905, where he has engaged in the real estate business.

Personal.

MR. ROBERT HUGHES was elected president of the Kentucky Electric Company, of Louisville, Ky., to succeed Mr. Donald McDonald, who resigned.

MR. C. C. BAIRD, formerly with the H. B. Camp Company at its New York office, has resigned his position with that company and is now with the McRoy Clay Works in Chicago as their sales representative.

MR. OSCAR C. TURNER has resigned as vice-president and general manager of the Southern Electrical Company, Nashville, Tenn., to join the staff of the Warren Electric & Specialty Company, of Warren, Ohio.

MR. WILLIAM LOEB, JR., secretary to President Roosevelt, has been elected a director of the Washington Railway & Electric Company, and it is rumored will resign as secretary June 1 in order to take the presidency of the system.

MR. GEO. H. PORTER, who has been in the sales department of the Electric Appliance Company, Chicago, for the past two years, has resigned to associate himself with the Diamond Rubber Company. Mr. Porter will be connected with a new department of this company, which will engage in the manufacture of insulated rubber covered wires and cables.

MR. F. A. HARMON, of Fremont, Neb., has been appointed general manager of the Fremont Power Company, of Sumpter, Ore. Mr. Harmon succeeds Mr. John Thomsen, who has had charge of both the Fremont Power Company and the Red Boy Mining Company. Mr. Thomsen will now devote his entire time to the Red Boy Mining Company, of which he is general manager.

CAPTAIN HUBERT S. WYNKOOP, for some years past commissary of subsistence of the Twenty-third Regiment of infantry, N. G. N. Y., has been appointed commissary of subsistence, with rank of major, on the staff of General John G. Eddy, commanding the Second Brigade. Captain Wynkoop has served for thirteen years in the New York National Guard and had served previously in the national guard of Minnesota, Illinois and California. He is well known in the electrical and mechanical circles of Greater New York.

MR. EDWARD P. BURCH, electric railway engineer, is giving a course of lectures to the senior electrical engineering students at the University of Minnesota on "Electric Traction for Heavy Railway Service." These lectures supplement the regular course in electric railways by Prof. Springer, and include the following subjects: Introduction, advantages of electric traction, characteristics of steam locomotives, characteristics of electric locomotives, problems of electrification, load factor, cost of steam and water power, power plants and transmission lines, plans of complete electrification and data sheets.

MR. W. W. NICHOLSON.—Manager W. W. Nicholson, of Syracuse, N. Y., has completed 25 years of service with the Central New York Telephone & Telegraph Company. Mr. Nicholson has been the recipient of felicitations from friends near and far. Mr. Nicholson is also general manager of the Empire State Telephone & Telegraph Company, which operates in seven counties west of Syracuse. His headquarters are in the general offices of the company at Syracuse, although for a long period he was located in Utica. His brothers are H. H. Nicholson, division superintendent, with headquarters at Utica, and W. S. Nicholson, superintendent of plant of the Hudson River Company, at Albany.

COL. W. PRESTQN HIX, of New York City, who was at one time very prominent and active in the electrical field, and has more lately been engaged in acetylene development for the Commercial Acetylene Company, of New York, of which he was manager, is returning again to electricity. In 1881 he went with the old Edison Electric Light Company, which sent him West, and while there he made the famous contract for lighting the Louisville Exposition with 5000 Edison lamps. After that came similar work at the New Orleans, St. Louis and other expositions. He then went actively into the business of company organization, and founded Edison companies in Topeka, Kansas City and St. Paul. The largest piece of work of this kind was the formation of the Philadelphia Edison Company with a capitalization of $2,000,000. This generally fatiguing work was followed by a rest of two or three years, when Col. Hix took up the development of later inventions, and then joined hands with Com. E. C. Benedict in pushing the use of acetylene gas, now so widely known. Col. Hix believes, however, that electrical development is now reaching a new stage of expansion, and that the opportunities for new appliances or apparatus of merit are greater than they ever were in the old days, when circuits were so few and far between or did not exist at all.

Late Items, Unclassified.

RICHMOND, CAL.—The East Shore & Suburban Railway Company has recently purchased one 500-kw motor generator set, complete with switchboard, and three 200-kw transformers, from 10,000 to 440 volts, from the General Electric Company.

SUFFIELD, CONN.—The Village Water Company is contemplating establishing a day service for motors if the demand is sufficient to warrant it.

AUGUSTA, GA.—Bids will be received until Feb. 25 by the commanding officer of the Augusta Arsenal for furnishing and delivering a switchboard, motor generator sets, motors, air compressors, metal working and wood working machines, electric and hand-over cranes, etc.

BARNESVILLE, GA.—The citizens voted recently to issue $45,000 in bonds, $4,000 of which is to be utilized to increase the output of the municipal electric light plant.

VINCENNES, IND.—The City Council has granted a franchise to the Hydro-Electric Company, which proposes to build a dam on the White River at Decker to develop power to generate electricity. The franchise provides that the company shall use conduits for wires and to furnish electricity free for lamps for all city buildings and public school and library buildings, and to furnish 2000-cp arc lamps until midnight for $4 a month, or all night for $5.50 a month; and to furnish electricity for incandescent lamps at a flat rate of 6½ cents per kw-hour. Eugene Rush, who is at the head of the Hydro-Electric Company, states that 75,000 horse-power can be developed at Decker. The company proposes to furnish electricity to all the towns and cities in southwestern Indiana.

CLINTON, IA.—The City Council has passed an ordinance requiring that all the telephone wires be placed underground in the city. The Iowa Telephone Company has announced that it will erect a new telephone building and place its wires in underground conduits throughout the city at a cost of $175,000. The wires of the Tri-City Telephone Company will also be placed underground.

BAY CITY, MICH.—The City Council on Jan. 14 voted to award contracts for machinery for an entire new electric lighting system in this city, which will involve an expenditure of approximately $48,000. The machinery in the old plant, which is inadequate to meet the present demands, will be sold.

COLUMBUS, MISS.—The City Council has granted the Columbus Railway, Light & Power Company permission to construct a street car line on the Military Road. The new line will be about three miles in length.

OXFORD, MISS.—The Board of Mayor and Aldermen will soon offer for sale the $15,000 in bonds recently authorized for the construction and equipment of an electric light plant, work on which will commence as soon as the bonds are sold.

ARCADIA, MO.—The plant of the Arcadia Creamery has been purchased by Louis Miller. Mr. Miller proposes to install an electric lighting plant to light the towns of Arcadia and Ironton and to enlarge the ice plant.

JOHNSON, NEB.—The citizens are contemplating installing an electric light plant and are considering an offer made by the city of Tecumseh for part of the machinery of the old plant in that place. The machinery is in good order, but has been discarded, owing to a change of equipment in the new plant.

ORANGETOWN, N. Y.—Following the recent action of the Orangetown Town Board, which asked the State Commission of Gas and Electricity, now abolished, to change the electric lighting rates from 20 cents, 10 cents and 5 cents per kw-hour for the first, second and subsequent hours, to a flat rate of 15 cents per kw-hour, the Orangetown taxpayers met at Tappan last week to take action against the new rates, which had almost doubled the cost of electricity to the consumers. As a result of the meeting, petitions are being circulated throughout the town, which will be sent to the Public Service Commission.

CHARLOTTE, N. C.—Electrical energy from the plant of the Southern Power Company, at Great Falls, S. C., 104 miles distant, is now being transmitted to the town of Statesville, N. C., where large contracts have been placed for furnishing electricity for lamps and motors, etc. The local interests of the company will be in charge of D. J. Cochrane.

HIGH POINT, N. C.—A movement has been started here to have the city get possession of the local electric lighting plant before the expiration of the private lighting contract, which runs about two years longer.

SALISBURY, N. C.—The Whitney Company will build a sub-station in Albemarle, 15 miles distant, for the purpose of furnishing electrical energy for several cotton mills in the town. Surveys of the route for the transmission lines will be made at once.

MINER'S MILLS, PA.—An agreement has at last been reached by the borough of Miner's Mills and the Standard Electric Light Company, of Parsons, whereby the streets of the borough will be lighted by electricity, which have been in darkness since December, 1906. By the terms of the contract the company agrees to furnish electrical energy for 22 arc lamps at a cost of $1,400 per year, and for incandescent lamps at the rate of one-half a cent an hour, upon the condition that the company is to be free from paying taxes on its poles and wires.

GREENVILLE, S. C.—Announcement has been made of the completion of plans and the securing of the necessary capital for building an electric line from Greenville to Williamston, S. C.

SPARTANBURG, S. C.—The Town Council has granted a franchise to the Electric Manufacturing & Power Company to erect transmission lines in the town. The company is to reserve 500 horse-power for the city for three years, while the city may place a contract for lighting the town for ten years. The energy will be brought into the city from the new plant on Broad River, built by Pittsburg capitalists.

METALINE, WASH.—J. M. Welty, of Metaline, has applied to the Board of Commissioners of Stevens County for a 30-year franchise to build a telephone line between Metaline and Colville.

MONCTON, N. B.—At the coming session of the Legislature the city of Moncton will make application for permission to construct and operate a street railway in Moncton and Shediac.

RICHMOND, N. B.—The York & Carlton Telephone Company has been incorporated with a capital of $5,000 to build a rural telephone system in York and Carlton counties. The incorporators are J. Y. Flemming, J. F. Merrithew and B. D. Hoyt.

FORT WILLIAM, ONT.—The city is applying for the right to issue bonds to the amount of $50,000 for the purpose of building a municipal street railway system. Address Mayor Whalen. The City Council has offered the city of Port Arthur $75,000 for all the street railway lines and barns within the limits of this city. The offer also includes the purchase of half the rolling stock owned by Port Arthur. Address Commissioner Fortune, Fort William, Ont.

Weekly Record of Electrical Patents.

UNITED STATES PATENTS ISSUED JAN. 14, 1908.

[Conducted by Rosenbaum & Stockbridge, Pat. Attys., 41 Park Row, N. Y.]

876,326. AUTOMATIC ELECTRICAL RELEASE STARTER; Anthony J. Burns, Oswego, N. Y. App. filed March 15, 1907. Construction of automatic release starter adapted for use in connection with alternating-current motors for starting the same and opening the circuit in case of failure of current. Has a weight-operated trip.

876,330. PROCESS OF MAKING INCANDESCENT LAMP FILAMENTS; Walter G. Clark, New York, N. Y. App. filed Oct. 4, 1906. The herein-described process of making incandescent lamp filaments, which consists in heating a filament by passing a current of electricity through it in the presence of a volatile compound containing carbon, and a volatile compound containing silicon and chlorin, and also in the presence of a substance having a greater affinity for chlorin than has silicon.

876,331. PROCESS OF MAKING ELECTRIC LAMP FILAMENTS; Walter G. Clark et al., New York, N. Y. App. filed Nov. 30, 1906. The herein-described process of making filaments for incandescent lamps, which consists in passing an electric current through a filament, in an atmosphere containing marsh gas, clefiant gas, and a reactive agent containing oxygen, together with a volatile silicon compound.

876,332. PROCESS OF MAKING INCANDESCENT LAMP FILAMENTS; Walter G. Clark, New York, N. Y. App. filed Jan. 14, 1907. The herein-described method of making electric lamp filaments, which consists in heating a carbon filament base in the presence of a volatile carbonaceous compound, a volatile silicon compound containing chlorin, and a substance having a greater affinity for chlorin than has silicon or the combination of silicon and carbon.

876,346. PROCESS OF PRECIPITATING METALS; John E. Greenawalt, Denver, Col. App. filed April 3, 1905. The herein-described process of precipitating gold and silver from their chlorid or bromid solutions, consisting in passing the solution through a mass of metallic lead shavings formed by alloying 1 per cent or less of zinc with the lead and then finely dividing said alloy.

876,383. MEANS FOR PRODUCING ELECTROMAGNETIC WAVES; Joseph Murgas, Wilkes-Barre, Pa. App. filed Jan. 4, 1905. Renewed Nov. 26, 1907. Complete diagram of circuits including spark gap directly in aerial.

876,384. AUTOMATIC FIRE-ALARM; Samuel Murray, Dublin, Ontario, Canada. App. filed April 20, 1907. A fire-alarm device having a bent compound metal band fixed at one end and connected at the other end to a lever so as to make a contact.

876,390. INCANDESCENT ELECTRIC LAMP; Herschel C. Parker and Walter G. Clark, New York, N. Y. App. filed Jan. 24, 1906. Has a relatively high-resistance conductor and a contacting member lying against and making a side contact therewith, said contact member being graduated from a higher to a lower resistance along its length.

876,391. TELEGRAPHIC KEY; Roy K. Patterson, Chicago, Ill. App. filed Dec. 29, 1906. Telegraph transmitting instrument having two keys, both of which move vertically as usual and one of which forms dashes and the other dots.

876,400. ELECTRICAL DISTRIBUTING RACK; Charles A. Rolfe, Adrian, Mich. App. filed Feb. 17, 1903. A distributing rack having a plurality of identical sections placed side by side so as to make one long rack or board.

876,413. POLARIZED RELAY; Chester H. Thordarson, Chicago, Ill. App. filed March 31, 1904. Construction of polarized relay in which the work to be performed is accomplished through the attractive force exerted by an electromagnet upon its armature, the direction of application of the work being controlled by the attractive force exerted upon the polarized armature.

876,419. SYSTEM OF AUTOMATIC BLOCK SIGNALING FOR RAILWAYS; Samuel M. Young, New York, N. Y. App. filed Nov. 1, 1907. Block-signaling system for railways divided into block sections, the track rails constituting conductors for the signaling current. Is designed to be proof against operation by stray currents from accidental sources.

876,423. DEVICE FOR INDICATING THE POSITION OF WATER OR SLUICE GATE VALVES; Francis E. Adams, Boston, Mass., and Christian W. Kragh, Madison, Wis. App. filed Sept. 7, 1905. Indicator designed to be located at a distance from the gate valve which controls a flow of water and electrically connected thereto, whereby the position of the valve is indicated upon a suitable dial.

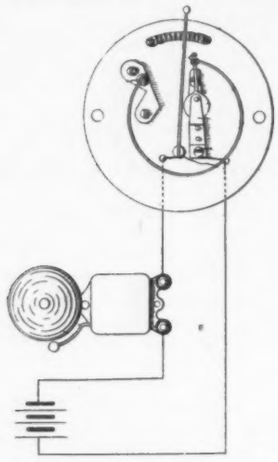
876,434. NON-INTERFERING PARTY-LINE TELEPHONE SYSTEM; William R. Brown, La Fayette, Ind. App. filed Jan. 18, 1907. In a telephone system, the combination with a party telephone line, of a

generator at each sub-station wherewith the parties on the line may selectively signal either central office or the other parties on the line, and means depending upon the position of the switch-hook for changing the selective apparatus from one condition to another, substantially as described.

876,441. MOTOR CONTROLLING DEVICE; William E. Date, Westfield, N. J. App. filed March 14, 1907. A controllor for electric motors designed to stop the motor at a predetermined point and which provides for reversing the direction of the motor at predetermined intervals.

876,445. ELECTROLYTE FOR ALKALINE STORAGE BATTERIES; Thomas A. Edison, Llewellyn Park, Orange, N. J. App. filed May 10, 1907. An alkaline electrolyte for storage batteries employing lithium hydroxid.

876,489. ELECTRIC RAILWAY SYSTEM; Samuel B. Rappleye and John J. Devine, Philadelphia, Pa. App. filed Nov. 22, 1906. Patentee



876,384.—Automatic Fire Alarm.

has a specially constructed U-shaped insulating trough extending outward from the web of the track rail and on the under protected side of which is supported a trolley wire or conductor.

876,492. TROLLEY POLE CONTROLLER; Oscar A. Ross, Chicago, Ill. App. filed Jan. 12, 1906. The trolley pole is pivoted on a swiveling support on the car roof and has a trip connection with its operating spring so that it drops in case of an undue upward movement.

876,503. SAFETY DEVICE FOR ELECTRIC CRANES; Marius R. Suliot, Salem, Ohio. App. filed July 24, 1907. A means for preventing overwinding or overlowering in the operation of electric cranes. Includes a cut-out switch operated by stops on the working cable.

876,511. PUSH-BUTTON SNAP SWITCH; John A. York, Hartford, Conn. App. filed July 29, 1907. Snap switch of the type having two buttons and a spring impelled part displaced thereby with an abrupt movement. Has a novel form of cam displaced detent.

876,512. FIRE-ALARM SYSTEM; Martin A. Abrahamson, Copenhagen, Denmark. App. filed Feb. 1, 1905. Designed to register distinctive trouble signals when a line is grounded or the voltage has fallen off, etc., so that the inability of the apparatus to transmit an alarm is indicated.

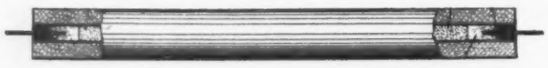
876,515. ELECTRICAL BINDING CLIP; Bradbury L. Barnes, Providence, R. I. App. filed Dec. 17, 1906. A form of nut having a sheet metal receiver and designed to be threaded on to the end of a conduit pipe so as to cover up the rough edges thereof.

876,552. SOCKET SHELL; Harvey Hubbell, Bridgeport, Conn. App. filed March 5, 1907. A socket shell comprising members having interlocking threads, one of said members being provided with a guide collar separated from this threaded portion by an annular space to receive the other member.

876,555. AUTOMATIC SWITCHING DEVICE FOR USE IN FLASH ADVERTISING; Leonard K. Job, Notting Hill, London, England. App. filed Dec. 27, 1905. A contact cylinder is rotated step by step by solenoid operated ratchet mechanism.

876,568. DYNAMO-ELECTRIC MACHINE; Charles E. Lord, Norwood, Ohio App. filed June 7, 1905. In a dynamo-electric machine, a stationary core made up of groups of laminæ spaced apart to form ventilating passageways therebetween, a rotatable member, means for forcing a blast of air through said passageways, and means for preventing said blast of air while passing through said stationary core from entering the air gap between the rotatable member and stationary core.

876,594. CONTROL SYSTEM; G. B. Schley, Norwood, Ohio. App. filed Dec. 31, 1906. A multiple unit train control system having pneu-



876,390.—Incandescent Electric Lamp.

matically operated main controllors operated by a master controller of the engineer's valve type.

876,600. TROLLEY GUARD; C. W. Sheehan, Lubec, Me. App. filed Oct. 11, 1907. The trolley harp has spring-impelled arms adapted to move upward on either side of the wheel to prevent displacement thereof from the wire.

876,602. CEMENT-BURNING FURNACE; W. E. Snyder, Nazareth, Pa. App. filed March 11, 1907. Cement is sifted rotatably through a circular path having series of carbon electrodes.

876,619. JUNCTION BOX FOR ELECTRIC WIRES; L. P. Bliemeister, Buffalo, N. Y. App. filed July 20, 1906. A junction box comprising a telescoping body portion and a telescoping cover, said portion having openings for the introduction of circuit wires.

876,639. ELECTRIC SAD IRON; W. M. Harwood, Ontario, Cal. App. filed May 27, 1907. A hollow flat-iron having passages to receive prismatic resistance elements which are secured by a single clamping plate.

876,641. VOLTAMETER; H. S. Hatfield, Hove, England. App. filed Oct. 14, 1907. Has a system of calibrated tubes by which the amount of gas in an accumulating gas voltameter can be measured.

876,659. ELECTRIC RAILWAY; O. D. Prescott, New York, N. Y. App. filed May 25, 1906. Construction of spring-impelled shoe for engaging the underside of a third rail.

876,669. TELEGRAPHIC TRANSMITTER; D. S. Troth, Fruitvale, Cal. App. filed April 6, 1906. A transmitting typewriter of the kind having a continuously revolving cylinder and key-operated detents for clutching different circuit-closing elements into action.

876,684. BLOCK-SIGNAL APPARATUS; A. Bevah, Providence, R. I. App. filed March 8, 1907. System adapted for use on single-track trolley roads to warn cars from entering a block from opposite directions. Is applicable to "space" cars or trains on double-track roads. Has circuit-closing devices actuated by the trolley wheel.

876,686. MEANS FOR OPERATING ALTERNATING-CURRENT MACHINES IN PARALLEL; M. Brooks and M. K. Akers, Urbana, Ill. App. filed Jan. 18, 1907. The combination with a plurality of alternating-current machines connected in parallel circuit, electric transformers, primary coils for said transformers included in series circuit with the respective machines, and the secondary coils of a given phase, for said transformers connected in a closed series circuit with one another, and self-synchronizing reactance coils in circuit with the respective machines.

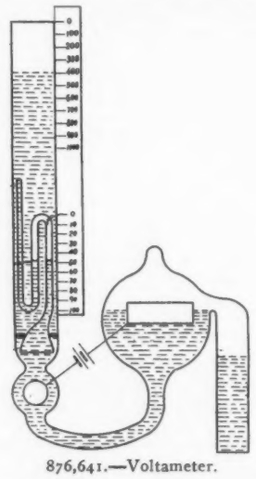
876,700. TROLLEY HARP; B. L. Dresser, Uxbridge, Mass. App. filed March 19, 1907. A trolley harp removable from the pole by releasing a pair of spring detents and having springs engaging the wheel to make good contact therewith.

876,701. ELECTRIC SWITCH; H. Drewell, Charlottenburg, Germany. App. filed March 9, 1907. Means for closing an optional branch of a multiple branch circuit by means of a limited number of switches.

876,722. TROLLEY; J. H. Kroen, Monaca, France. App. filed July 23, 1906. The trolley harp has upwardly projecting arms carrying vertically pivoted rollers on either side of the trolley wheel.

876,773. MERCURIAL THERMOSTATIC CIRCUIT CLOSER; F. Cossor, London, England. App. filed Aug. 15, 1907. The mercury column has a break filled with rarified air and electrical connections for different portions of said column located upon the opposite sides of said break.

876,809. ELECTRIC SWITCH OR CUT-OUT; I. Kitsee, Philadelphia, Pa. App. filed Oct. 14, 1905. A circuit interrupter for high potential circuits including a wooden trough tiltable longitudinally and having



876,641.—Voltameter.

a little car movable therein by gravity from end to end. The car unwinds a flexible cable behind in its movement. The trough contains oil which is agitated at the time of circuit closure by the motion of the trough.

876,828. INSULATOR; R. C. McNutt, Mendota, Ill. App. filed March 21, 1907. A construction of armored insulator having a sheet metal casing connected to the insulator by metallic rivets.

876,877. WALL BOX FOR ELECTRIC SWITCHES; R. W. Hollis, Atlanta, Ga. App. filed June 18, 1906. A wall box for electric switches having a specially constructed fastening with the lathes of a partition, whereby its surface shall be flush with the plastering.

876,882. CIRCUIT CONTROLLER FOR ELECTRIC MOTORS; J. M. Joy, New York, N. Y. App. filed March 1, 1906. An electromagnetically operated controller for printing telegraph motors. Has both manual and automatic operating means.

876,883. CIGAR CUTTER AND LIGHTER; A. Von Kaspis, Pittsfield, Mass. App. filed Dec. 14, 1906. A construction of cigar lighter having a standard containing a dry battery and a base containing an induction coil. Has a swinging oil receptacle and wick.

876,886. CABLE TELEGRAPHY; I. Kitsee, Philadelphia, Pa. App. filed March 3, 1906. Means for relaying or translating true reversals impressed upon lines of comparatively large capacity.

876,910. ELECTRIC SWITCH; C. G. Perkins, Hartford, Conn. App. filed Feb. 19, 1906. Construction of a knifeblade switch having receptacles for cartridge fuses between a pair of switch blade elements.

876,918. CIRCUIT BREAKER; P. H. Thomas, Montclair, N. J. App. filed Jan. 6, 1905. Renewed Feb. 19, 1907. A circuit breaker for alternating currents having a mercury vapor tube shunt for the switch, which automatically interrupts the alternating current at the zero of the wave.

876,922. ELECTRIC LAMP; J. De Martino, Breesport, N. Y. An electric lamp consisting of a top; a base-ring secured to said top and formed with a groove the walls of which are perforated; a carrier-ring mounted in said groove and formed with a perforation adapted to register with the perforations in the walls of said groove; means for detachably securing said base-ring and carrier-ring together; a globe mounted in said carrier-ring, and a filament carried by said top and inclosed by said globe.